Fraport AG Quadrupled Throughput of Baggage Transportation Control System

Paved way for future growth with OpenVMS clusters based on HP Integrity server blades

"The upgrade to HP Integrity server blades under OpenVMS has enabled us to accommodate new gates and new control functions so that we can better handle peak travel volumes while still meeting our 45-minute delivery requirement."
Kay Belke, software engineer, Fraport AG

HP customer case study: Fraport AG

Industry: international transportation

Objective

- Provide a reliable, disaster-tolerant baggage logistics system and real-time database
- Increase system throughput to handle an increasing number of travelers, especially during peak travel seasons
- Ensure high uptime
- Cut IT maintenance costs
- Migrate to faster, more advanced platform with minimal business disruption

Approach

- Implement HP Integrity BL860c server blades in four high-availability clusters, each with three nodes running HP OpenVMS operating system

IT improvements

- Improved overall throughput 400%
- Reduced CPU utilization 50%
- Reduced compute queues 50%
- Migrated effortlessly to HP Integrity server blades running OpenVMS while only modifying 3% to 5% of code
- Achieved required 99.9% uptime
- Clustered environment ensures fault tolerance and high availability

Business outcomes

- Migrated to HP Integrity server blades with virtually no operational disruption
- Reduced maintenance costs to near zero with HP Integrity server blades
- Ensured guaranteed baggage turnaround of 45 minutes
- Improved quality of service for travelers
- Provided headroom to accommodate future traveler volumes

World-class baggage handling

On peak days, more than 180,000 passengers use the Frankfurt Airport. It is the busiest commercial airport in Germany, the seventh largest international airport, and a major continental gateway to Europe. The airport accommodates a passenger volume of more than 52.8 million annually, and that number continues to climb.

The airport's sophisticated baggage system is the brainchild of Fraport AG (www.fraport.com), the owner and operator of Frankfurt Airport, and it is a modern engineering marvel. It includes 22,488 drives controlling a 73-kilometer conveyor facility (known as the GFA) running at speeds of up to five meters per second in the tunnels between the three terminals. These impressive statistics are a testament to Fraport AG's innovation in aviation ground services.

Because Frankfurt is a hub airport, Fraport must handle more than 100,000 pieces of incoming and 100,000 pieces of outgoing baggage on its busiest

days. Even with three separate terminals handling baggage, each bag reaches its destination within 45 minutes—with an unprecedented track record of reliability.

To run the state-of-the-art baggage transportation control system, Fraport relies on four high-availability clusters of HP Integrity BL860c server blades in three separate locations—all running the HP OpenVMS operating system. Fraport has relied on OpenVMS for more than 17 years because of its proven strength in clustering, making it easy to build a disaster-tolerant system. By having clusters running in separate terminals, Fraport has both system and network redundancy, as well as data mirroring with OpenVMS and two HP StorageWorks enterprise virtual array (EVA) storage systems. If one component fails, the operation can continue without transaction loss.

"The baggage transportation control system at Frankfurt Airport is one of the most advanced and controls one of the largest and most sophisticated conveyor systems in the world—53 million travelers rely on it every year," says Kay Belke, software engineer for Fraport AG. "We can't allow much more than five minutes of downtime, which is why we have always relied on HP OpenVMS due to its reliability, fault tolerance, and proven robust clustering capabilities."

Complex logistics call for sophisticated IT

There are 464 central check-in counters for passengers in two terminals and at a long-distance railway station located in the airport feeding into the baggage handling system. The baggage system contains all the necessary data for each flight. In addition to the departure time and ramp position, it also contains the extraction point to ensure the shortest route to the plane. When the flight number is entered, each item of luggage is issued a set destination address that is activated in combination with the container number. Automatic elevator installations feed the baggage into the system. During the entire underground transport, computer-controlled reading systems check the containers using a bar code on the outside. In this way, each container is automatically transported to its destination.

Controlling these complex logistics requires advanced information technology, especially because many special cases occur. Booking changes, irregularities, and security contingencies all call for comprehensive tracking and tracing of all baggage.

The baggage transportation control system uses applications custom-developed by Fraport including Baggage Operational Applications (BOAP), as well as a management system called the Baggage Operational Database (BODB), running on Oracle 10*g* RAC R2. All baggage data from the subsystems is collected into the BODB database, which is continually updated. The BODB receives information in real time from various custom-developed applications that support distribution of transfer baggage, control the baggage conveyor off-loading points, and gauge the amount of traffic on the conveyors handling inbound baggage; these applications also process baggage service messages from carriers. The GFA conveyor facility that ferries baggage from place to place is controlled by a Primos real-time database from ABB.

According to Belke, the interoperability of OpenVMS is very important because the airport has various systems, all of which produce data. The airport, therefore, requires an interface to all of these systems.

Sorting up to 18,000 pieces of luggage an hour, the system runs with great precision. Only two items per thousand do not directly reach the correct destination—and this is usually due to causes such as too-large items or broken mechanical parts. The airport's baggage service has been certified and re-certified several times based on the requirements of the ISO 9001 quality standards.

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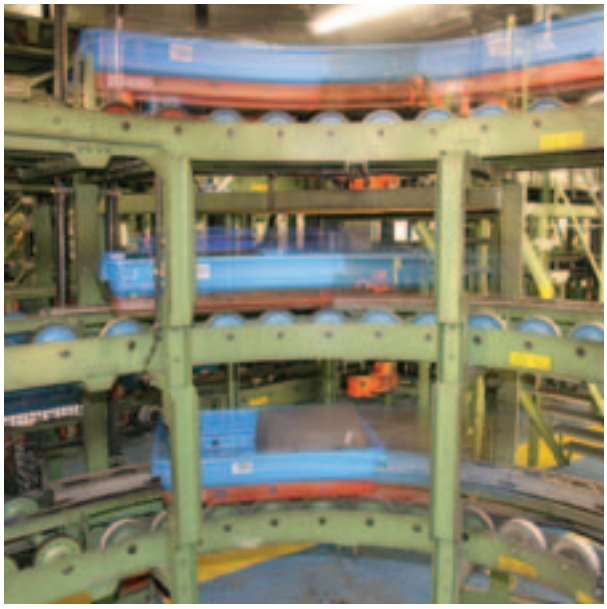


Continuous improvement to meet ever-growing demand

The baggage transportation system started out on VAX systems and then moved to HP AlphaServer systems, but demand at the airport continues to grow, as do security requirements that call for stricter baggage control. Over the next few years, Fraport expects an average increase in traffic volume of about two million passengers per year—and a corresponding increase in baggage. To accommodate growing demand, Fraport is building an extension to Terminal 1 due to be in production in 2012 and a new third terminal at the south end of the airport due to open in 2018, and it is extending the baggage-handling infrastructure for both to maintain the 45-minute guaranteed transfer time. "We continuously have more travelers and higher peak demand spikes—and we need to accommodate future growth and more stringent security requirements, all while meeting our 45-minute transfer time," says Belke. "All of these factors pointed to the need for a faster, even more reliable infrastructure to run the baggage handling system."

In addition to the need to accommodate growth, Fraport was concerned about the longevity of the AlphaServer systems, which would soon be out of service. Known as an industry innovator, Fraport is always prepared for the future. Maintenance costs for the legacy platform were also mounting, something Fraport wanted to remedy.

In the middle of 2008, Fraport AG began porting its baggage transportation control system (GSV) software to Itanium®-based systems. Then in early 2009, Fraport worked with Maklee Engineering (www.maklee.com) to migrate to OpenVMS on the HP Integrity platform.

"When we saw that Fraport was running on AlphaServer systems, we mentioned that Integrity server blades would be faster and less expensive," says Guy Peleg, president of Maklee Engineering. *"HP Integrity systems based on the Intel® Itanium processor were a natural fit for Fraport due to their power, scalability, cost-effectiveness, and reliability—and there was never any question about staying with OpenVMS due to its reliability. The main objective is making sure travelers' luggage is delivered before the plane takes off—and the reliability of OpenVMS is key to making that happen."*

Rock-solid reliability

According to Belke, the migration went smoothly. In fact, only about 3% to 5% of the software code had to be altered during the move from AlphaServer to HP Integrity systems. The team migrated one cluster per night over a period of four nights to help reduce risks and maintain continuous baggage delivery operations. "The port to Integrity server blades was not difficult at all, and the actual switchover went well," says Belke. "We knew we were in good hands with Guy Peleg, since he was part of the team at HP that developed OpenVMS and ported it from Alpha to Itanium."

Customer solution at a glance

Primary applications
- Baggage Operational Applications (BOAP)
- Baggage Operational Database (BODB)

Primary hardware
- Four OpenVMS clusters comprising HP Integrity BL860c server blades

Primary software
- OpenVMS v8.3-1H1
- Oracle 10*g* RAC R2
- ABB Primos database

Services from HP
- HP Support Plus 24

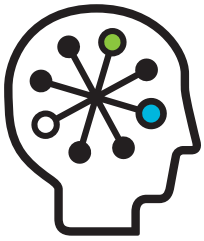
Today, the baggage transportation control system runs on four high-availability clusters of HP Integrity BL860c server blades in three separate locations—all running the HP OpenVMS operating system. With system and network redundancy, Frankfurt Airport has had exceptional uptime. "We take the conveyor system down intentionally for an hour and 30 minutes each night to repair motors and make sure everything is running properly with the GFA," says Belke. "But since the new system based on OpenVMS on Integrity [systems] has gone live, we have had no unplanned downtime of the baggage control system."

Frankfurt Airport maintains the software and other systems in-house and relies on HP for hardware and software support through HP's Support Plus 24 service. According to Belke, HP provides responsive support services. "During the migration, HP responded in the middle of the night to fix a minor hardware issue," recalls Belke. "It helped us ensure continuous baggage operations during the migration."

Headroom for future growth—all while lowering costs

The move to HP Integrity yielded immediate and substantial benefits. The HP Integrity server blades have enabled Fraport to cut maintenance costs to near zero while providing a platform that will last far into the future. Following the move to Integrity systems, CPU utilization dropped 50% when compared with the previous platform. Compute queues also dropped 50%, dramatically improving system responsiveness. "With CPU utilization and compute queues reduced 50% each, overall throughput of the system increased fourfold," says Peleg.

For Frankfurt Airport, HP Integrity systems running OpenVMS chart a course for the future of baggage transportation control and support a key requirement of one of the world's most advanced airports. "The upgrade to HP Integrity server blades running OpenVMS has enabled us to accommodate new gates and new control functions so that we can better handle peak travel volumes while still meeting our 45-minute delivery requirement," says Belke. "For Frankfurt Airport HP has always been a reliable partner in providing technology to our innovative baggage handling solutions."



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