pgEdge™

Case Study: gematik

Delivering Ultra-High Availability for Germany's National Healthcare Directory

The Challenge

gematik GmbH provides a central directory service for various purposes with data on organizations and persons in the healthcare sector.

The application, built using the HAPI FHIR API (a complete implementation of the HL7 FHIR standard for healthcare interoperability in Java) with the Hibernate framework, faced several challenges in meeting critical requirements such as:

- **Guaranteeing ultra-high availability** for a system supporting healthcare providers nationwide
- **Zero-downtime upgrades** to ensure continuous access to patient information
- **Enterprise-grade configuration and tuning** for SUSE Linux Enterprise Server (SLES) 15R5

Meanwhile, even more complexities were noted, including:

- **Extended maintenance windows** that resulted in unacceptable downtime for a national healthcare system
- **No ability to modify the application** due to HAPI FHIR API constraints, requiring database-level solutions
- **Complex data requirements** including the existing use of PostgreSQL legacy large objects for healthcare data storage

Traditional single-node PostgreSQL deployments couldn't meet the availability and upgrade requirements without significant application downtime, putting critical healthcare operations at risk.

The Solution

Arvato partnered with pgEdge to implement a distributed PostgreSQL solution that would deliver the required availability and operational flexibility without requiring changes to their HAPI FHIR-based application.

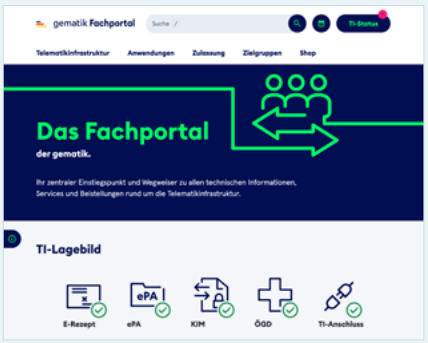
The project involved the following Key Implementation Details:

- **pgEdge Distributed PostgreSQL** deployment across multiple nodes
- **PostgreSQL upgrade** from version 14 to 16 with zero downtime
- **Snowflake sequence generation** to support distributed operations while maintaining Hibernate framework compatibility, including sequence caching capabilities
- **LOLOR extension** for replication of PostgreSQL legacy large objects between pgEdge nodes
- **SLES 15R5 deployment** with enterprise-grade configuration and tuning
- **Multi-node architecture** enabling independent node maintenance and upgrades

The solution was specifically designed to work seamlessly with the existing Java-based application using Hibernate ORM, ensuring no changes were required to the HAPI FHIR API or application code.

gematik

arvato BERTELSMANN



gematik GmbH is Germany's national digital health agency, responsible for designing, developing, and securely operating the country's telematics infrastructure (TI). As the central authority for digital healthcare, gematik defines interoperability standards, reference architectures, and certification processes used across the healthcare sector. Its portfolio includes the electronic patient record (ePA), e-prescriptions, identity and access management, secure communication standards, and FHIR-based interfaces that enable data exchange between providers, insurers, and digital health applications. Working with insurers, healthcare professionals, industry partners, and government institutions, gematik drives nationwide digital transformation. With 51% federal ownership, it serves as a neutral coordinating authority for Germany's digital healthcare ecosystem.

Industry: National Healthcare

Why pgEdge

The customer evaluated several alternatives, but selected pgEdge for several strategic reasons:

- **Open-source foundation** was critical to avoid vendor lock-in
- **Dedicated professional support** throughout the migration and deployment process
- **Proactive partnership approach** in solving technical hurdles
- **Proven expertise** in distributed database architecture for mission-critical applications
- **Commercial-grade high availability enablement** without sacrificing open-source flexibility
- **More affordable total cost** compared to other enterprise solutions.

Business Impact and Strategic Value

The introduction of a pgEdge-based architecture provides substantial strategic value for gematik GmbH as the central authority for digital health infrastructure in Germany. As the organization responsible for defining, governing, and ensuring the reliability of national healthcare interoperability services, gematik benefits significantly from a database layer designed for ultra-high availability, consistency, and operational resilience. By leveraging an open-source, distributed PostgreSQL solution, gematik avoids vendor lock-in and ensures long-term technological independence while strengthening the reliability of Directory Services used across the Telematikinfrastruktur (TI).

A pgEdge deployment enhances the robustness of the gematik Directory Service—one of the foundational trust and information services of the TI—by enabling true multi-node redundancy with active-active replication. This architecture ensures that essential directory information (such as identities and certificates) remains accessible even during node failures, maintenance windows, or regional outages. With pgEdge, system downtime is reduced from hours to near-zero during upgrades and patching activities, while independent node updates preserve the availability of downstream healthcare applications.

Throughout the implementation, pgEdge remains fully aligned with Germany's stringent health data security and compliance requirements, including strict governance around identity management, encryption, auditability, and operational integrity. This ensures that gematik's Directory Service maintains its role as a trusted, authoritative backbone of Germany's digital health infrastructure.

Today, the gematik Verzeichnisdienst continues to serve as the central, authoritative source for the entire health IT ecosystem. Strengthening this ecosystem with a resilient, redundant pgEdge foundation enables gematik to set new benchmarks for reliability, interoperability, and future-proof digital health architecture across Germany—and potentially provides a blueprint for other national digital health programs across Europe.

About pgEdge

pgEdge® delivers open-source, 100% Postgres infrastructure for Agentic AI and other enterprise applications that demand high availability, reliability, and/or data sovereignty. Our mission is to make it easy to build, deploy, and manage enterprise-grade applications at scale on the open source Postgres database.

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