White paper

FUJITSU Software Symfoware Server V12.1

Delivering Business Continuity In a High Reliability Database

Contents

FUJITSU Software Symfoware Server is Fujitsu's relational database system.
Symfoware Server V12 is equipped with a PostgreSQL interface as an ecosystem-supporting database that can integrate with various internal and external tools, packages and exceptional open-source software.

This document explains the features of Symfoware Server V12 and the supporting technology.

1. Current database requirements and Symfoware Server approaches

Current database requirements

There is an abundance of data that is high in volume, includes a diversity of types and is of a high frequency. This data is known as "big data" and with the question of '*how quickly this data can be leveraged*' being the key to business success.
ICT systems are used for collecting, storing, analyzing, and then processing results of this big data. Currently, ICT systems provide an essential connection to our social lives. With the widespread use of the cloud and smart devices in recent times bringing about a transformation in work style, along with the utilization of big data, user expectations, and ICT responsibilities are increasingly by orders of magnitude.
The cornerstone of such ICT systems is the database. The level of database requirements is increasing year on year, proportionately with the increase in ICT system requirements.
There are several aspects to database requirements, as follows.

■ Open database leverages valuable business information

Fast system development times are essential to effectively leverage big data. There is a need for open systems that can be built in a short timeframe, by integrating easily with pre-existing software and packages, either from Fujitsu or another vendor.

■ Assurance of business operation reliability

With the increasing diversification of systems, users are not always able to specialize in such a wide range of database system builds. Previously, when installing database systems, specialist staff normally performed the setup right up to the point of being ready for commencement of operation. However, these days, because of business cost reductions, it is not unusual for users without specific database knowledge or experience to perform the setup.
Users demand simple installation and operation so that they can use the system with confidence.

■ High-reliability database that enables business to run without interruption

Uninterrupted operation is demanded for ICT systems that are linked business-to-business or for online businesses. It is a requirement that when unforeseen system stoppages occur, operations are maintained at a level where they can be restarted quickly. It is very important that business continuity is achieved and maintained. Accordingly, databases that operate within mission-critical systems need to run in a redundant configuration, where it is imperative that stability can be resumed without irreversible loss of data.

■ High-performance database that even enables processing of high-volume, high-frequency data within a given time

In order to convert data into valuable information, it is essential to have a stable and responsive system that enables the data to be processed within a specified time, even if the volume of users, usage frequency or the volume of data increases due to variations in business demand.

Symfoware Server strategy

This section explains the approach used by Symfoware Server V12.1 for satisfying current database requirements.

Firstly, an OSS (Open Source Software) interface (PostgreSQL interface), that is capable of supporting various environments, is able to be utilized for an open database.
Symfoware Server features have been extended and the PostgreSQL interface has been integrated to enhance application development efficiency and compatibility with other third-party software.

Secondly, assurance is provided by Fujitsu-developed software technology, which is mounted on the PostgreSQL interface. This delivers easy-to-use tools to the database users.

Thirdly, Symfoware Server provides features for enhancing reliability, such as redundancy and data encryption. Users can obtain a level of reliability that matches their system requirements.

2. Supporting "Open" technology

Using open interfaces

Symfoware Server is equipped with an interface that is fully compatible with PostgreSQL 9.2. Using Symfoware Server enables integration with various packages, data management systems, development tools and applications that utilize the PostgreSQL interface. A wide range of development environments and script languages are also supported. This leads to more efficient application development by being able to select an optimal development environment and script language. (See Figure 2-1 Support for packages and tools)

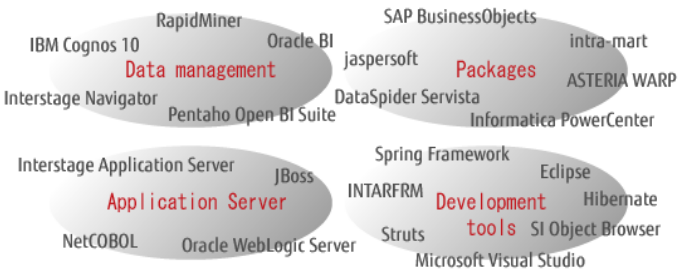


Figure 2-1: Support for packages and tools

The following is an introduction to Symfoware Server-specific features that are used with the PostgreSQL interface.

Linking to Visual Studio

For Symfoware Server, automatic creation of applications is possible by integration with Visual Studio. (See Figure 2-2 Connecting to Visual Studio)

■ Edit directly in Visual Studio's text editor

You can manually create applications to access database resources by using the specified components in Visual Studio. (See Figure 2-2 Connecting to Visual Studio(1))

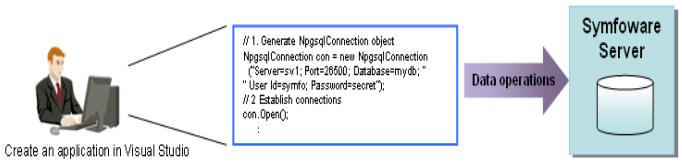


Figure 2-2: Connecting to Visual Studio(1)

■ Create applications with Visual Studio tools

You can automatically create programs for accessing database resources using basic operations such as drag and drop with the tools available in Visual Studio, such as TableAdapter and Server Explorer, making application development more efficient. (See Figure 2-3 Connecting to Visual Studio(2))

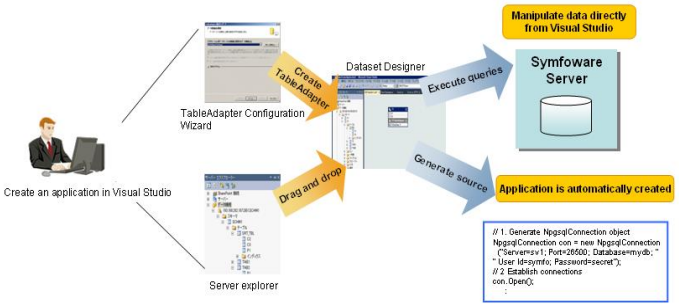


Figure 2-3: Connecting to Visual Studio(2)

Improved ability to migrate from other vendor databases

Features compatible with other vendor databases have been added to the PostgreSQL interface.

■ List of features compatible with other vendor databases

Category		Item	Overview
SQL	Queries	Outer join operator (+)	Operator for outer join
		DUAL table	Tables provided by the system
	Functions	DECODE	Compares and converts values
		SUBSTR	Extracts part of a string
		NVL	NULL value conversion
Packages		DBMS_OUTPUT	Sends messages
		UTL_FILE	Performs file operations
		DBMS_SQL	Executes dynamic SQL

This maintains high compatibility with other vendor databases, enabling easy migration from other vendor databases to Symfoware Server. The database migration workload has been significantly reduced, being just 1/8 that of conventional databases (based on actual values from Fujitsu).
Also, NCHAR type is supported as the data type for national characters.

3. Technology supporting assurance

Fujitsu-developed software technology

Fujitsu-developed software technology is a toolset for self-diagnosing the status of the hardware and software; it optimizes the configuration/settings and operation for ease-of-use and reliability. In many of the products provided by Fujitsu, Fujitsu-developed software technology has been employed. Of the numerous middleware available, Symfoware Server was among the first to adopt this technology.
Fujitsu-developed software technology eliminates the difficult design and operation specific to databases, allowing anyone to use the products confidently.
Two features that comprise Fujitsu-developed software technology for Symfoware Server are rapid setup and one-click recovery.

■ Rapid setup

Rapid setup automatically retrieves information from the server environment, such as disk size and memory, and automatically optimizes the allocation of the various database resources, taking into account data maintenance and performance. Also, the tuning parameters are automatically optimized based on Symfoware Server's extensive database and operations experience, to smoothly support all types of large and small systems with varying server configurations and numbers of connections. As a result, there is no need to perform the complex design work and tuning that was previously required when installing a database, so databases can now be built with relative ease, without the immediate need for a database specialist. (See Figure 3-1 Rapid setup)

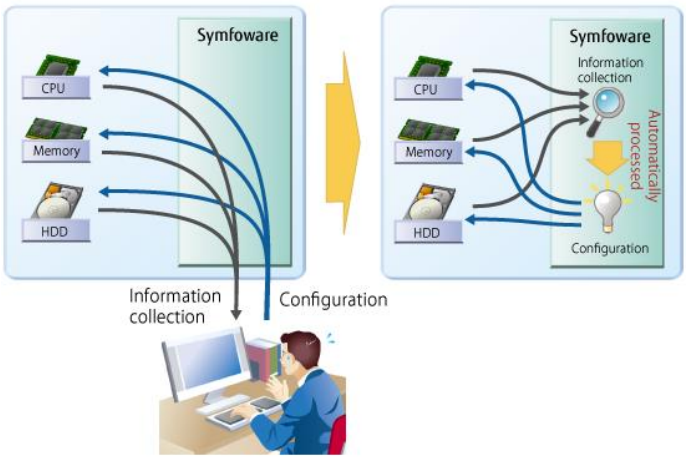
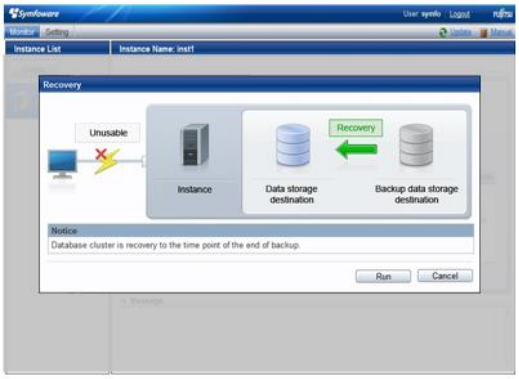


Figure 3-1: Rapid setup

■ One-click recovery

One-click recovery is a feature that automatically identifies errors and then performs recovery. Symfoware Server checks the resource usage status and transaction volumes leading up to the moment at which the error occurred, then determines the location of the error and specifies the appropriate recovery steps. Users can restore the server to a normal state with just one click, without needing to assess the cause of failure.
One-click recovery enables rapid resumption of jobs in the majority of cases of system errors (approximately 75%), such as operation errors and software failure, except where hardware failure occurs. (See Figure 3-2 One-click recovery)

Example of a database error



Example of error recovery execution

Figure 3-2: One-click recovery

The implementation of technology that supports simple installation/operation in the pursuit of intuitive products, also maintains a focus on newer product editions. The larger and more complex the system is, the greater the requirement for reliability and performance, with ease-of-use and prevention of incorrect operation becoming critical issues. For Symfoware Server, Fujitsu plans to deploy Fujitsu-developed software technology on newer product editions as well, as one approach toward resolving these issues.

4. Technology supporting high reliability and high performance

The following is an introduction to Symfoware Server technology that supports high reliability and high performance for databases and ensures business continuity.

Technology supporting high reliability

■ Failover operation

Failover is a feature that enables a substitute server to take over data processing in the event of a server failing. To assure business continuity, Symfoware Server provides failover features that are utilized to replicate the system on both the primary server and the standby server.
Note that in Symfoware Server, failover operation is made possible by integrating with operating system software such as PRIMECLUSTER and failover clustering.

■ Database multiplexing

Database multiplexing is a mechanism for making a database redundant without shared disks, by multiplexing the database itself. By allocating a disk to each server, loss of important data can be prevented, even if a fault occurs on a disk.
In Symfoware Server, databases are multiplexed using the streaming replication feature of PostgreSQL. In addition, you can use the independent features of Symfoware Server to detect faults in process, disk, network, and other operations, or to automatically execute database switchover or disconnection (when using the Symfoware Server Mirroring Controller option). These features enable fast and reliable resumption of operations. (See Figure 4-1 Database multiplexing)

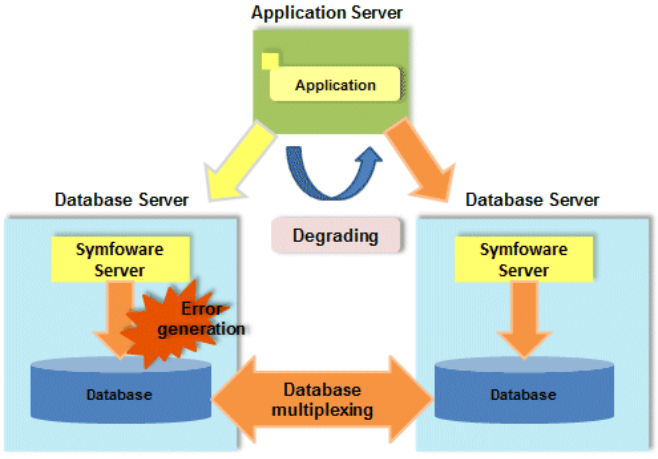


Figure 4-1: Database multiplexing

■ Data encryption

Symfoware Server supports PCI DSS (Payment Card Industry Data Security Standards), the security standard for the credit card industry, formulated with the aim of ensuring secure handling of credit card user information. An encryption feature for protecting data from threats such as unauthorized access, network eavesdropping and spoofing, is included as standard.

The encryption feature in Symfoware Server employs AES (Advanced Encryption Standard) as its algorithm, using 256-bit encryption keys, which is the maximum security level. Also, by using this in conjunction with Intel(R) AES-NI, which is a new encryption-related technology, encryption and decryption is achieved without sacrificing performance. Similarly, support is also available for "Software on chip" of the new SPARC64(TM) X processor, which enables high-speed encryption and decryption processing.
Furthermore, Symfoware Server is equipped with an extended PostgreSQL encryption feature to protect stored data through transparent data encryption. With this, each instance automatically processes data stored in the database by encrypting the data as it is written, and decrypting as it is read, so user/software-based encryption key management is not required.

Technology supporting high performance

In a database, throughput refers to the system's processing capacity with regard to referencing data or updating data within a specified period of time. Improving throughput is one of the techniques for creating high performance databases.
For Symfoware Server, improved throughput is achieved by the way it functions with the hardware.

- **PCIe Flash**

  PCIe Flash is a solid state drive that is incorporated into the server, and is used as a high-speed embedded disk.
  Symfoware Server supports PCIe Flash as a device for recording data.
  Faster data access can be realized by using PCIe Flash to distribute the I/O load.
  A high cost performance system can be built by optimally utilizing the memory, solid state drives and hard disk drives.
  (See Figure 4-2 Using PCIe Flash)

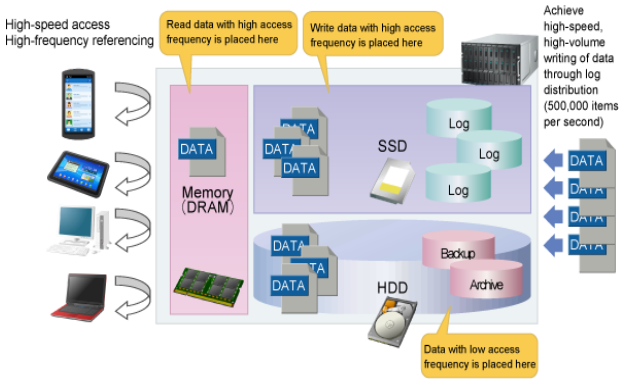


Figure 4-2: Using PCIe Flash

5. Conclusion

This paper introduced Symfoware Server features and technology from the perspectives of "Open", "Assurance ", "High reliability" and "High performance".
In a business environment faced with a dizzying rate of change, Symfoware Server continues to strengthen its functionality, including employing the vertically-integrated database system FUJITSU Integrated System HA Database Ready, and expanding upon mission-critical features. By working to continually improve the inventory of functions needed to realize a mission-critical database, inherited from the era of mainframe computers, and by proactively adding new functions in response to new business demands, Symfoware will continue to pursue technology to support continuance of business.