Firebird White Paper

Alternatives to virtualization for database servers

Holger Klemt, June 2017

Somehow the world of virtual machines is a world in which, according to their proponents, physical foundations are seemingly overridden. Whilst all responsible administrators and IT managers should know that computers, which are running under high load have more than enough to do, the benefits of virtual machines are praised in the highest tones, even though the software users are constantly concerned about poor performance and interminable waiting times.

We would like to illustrate the alleged benefits together with the real disadvantages based on the following calculation:

- An employee in a manufacturing company, with a gross monthly salary of $ 4,000 and estimated ancillary costs of about 25%, costs the employer around 0.9 cents per second (based on an average of 20 working days per month, 8 hours daily).

- A typical process handled by this employee takes an average of 10 seconds longer on an unsuitable database server than it would on a dedicated high-end database server, when executing a search and storing the data.

- This process is carried out by the employee on average 10 times an hour.

- Throughout the enterprise, 50 users are working with the same software, all of whom are performing the same number of tasks and having to wait just as long.

-Total = 10 seconds x 10 per hour x 8 hours x 20 days x 50 employees = 800,000 seconds of unproductive waiting time.

-800,000 seconds of unproductive time costs the employer at 0.9 cents around $ 7,200 each month!

-Or, in other words: a server that reduces the waiting time by 10 seconds saves 1.5 employee positions!

This is then invariably countered with: what is the cost of a complete system failure, and how easy it is in a virtualized world to copy from one hardware server to another with a simple mouse-click, and everything is back in order.

My question, how often the Firebird database server has failed in the past 10 years, is usually answered "never", with the exception perhaps of some exotic hardware failures. The fact that these hardware errors also affect virtual hosts is subtly ignored, because the VM can be transferred to the second host.

Due to the alleged advantages of virtualization, it is apparently possible to save an estimated 60 minutes of an employee's time for reinstalling a database server such as Firebird, which however has never been necessary for the past 10 years. Due to the poorer performance however, the above calculation illustrates the huge sums of time and money wasted, not to mention the employees' frustration.

However, as soon as management or department managers point this out to their system vendor or to their IT department, they are inundated with innumerable letter combinations and technical jargon, so that further detailed questions are avoided, so as not to show their ignorance of such highly sensitive processes. Ultimately, that's how everyone does things and there are no alternatives. The fact that the old dedicated database server, which did the job up until a few years ago, and achieved significantly shorter waiting times, is doubted by the IT department anyway.

There are basic company guidelines to be followed, and therefore everything is virtualized, end of discussion!

There's no need to consider every worst case scenario, everything failing at the same time just doesn't happen …

A customer reported that their very expensive storage (about $ 100,000) unexpectedly suffered a short circuit whilst replacing the CMOS battery (these small CR2032 batteries for 50 cents) and the entire storage could no longer be booted. A machine of the same design was not available, because the manufacturer could now only supply newer systems, and support for this system was only possible if it could be started at all. And it was also not possible to order new board at the manufacturer's.

Because the boards were to be formatted at the same time when put into a second-hand, almost identical system, they finally had to get used to the fact that the internally double-redundant mirrored storage was unfortunately now merely a very expensive data grave.

Although there were older versions of various files, the production data in the ERP system as well as the database VM which was on the storage was lost for a number of days. Extremely annoying, when you've delivered goods, but have no idea at all to whom and what ...

Solution: It is best not virtualize at all?

By no means; I would like to point out that we use virtual machines ourselves and they are really a blessing in many areas! But with a system such as the Firebird Server, which is so simple to install, and which fully utilizes the maximum performance of any hardware, the use of virtual machines with their associated performance loss is not only annoying, but from our point of view economic nonsense. A web server, for example, or a terminal server with applications, have significantly more complex configurations. Even the

attempt to restore an Apache server requires, without copies of all configuration files and page contents, an extreme amount of effort.

Due to the predominantly reading functionality of a web server, performance losses are relatively easy to avoid. Also web server users are often not paid by the company. So whether a process takes a few seconds longer than it should, depends very much on the business model, and such reading systems can often be very easily scaled across several machines, which may then of course also be virtual.

However, database servers generate a completely different load profile, in particular due to the significantly higher write load. A database server writes and reads many small, distributed sectors which are distributed all over the disk.

A real solution

The latest generation of IFS servers is a purely 100% dedicated Firebird server. We have optimized the configuration according to the latest findings for Firebird 2.5 and Firebird 3.0. An IBExpert benchmark value of around 500% for the Drive Index provides a performance, when executing simple and complex Firebird database operations, on average 10 times faster compared to most virtual machines.

The modular system allows the use of up to 2 fully redundant IFS Firebird servers, each with 800GB SSD storage for databases in a 19 inch rack with 2HE.

Because of the ever increasing bizarre changes in new Windows versions, and automatically installed Windows updates, we use Linux as the standard operating system. Various tried-and-tested settings and adjustments together with carefully selected hardware modules provide the ideal platform for the latest IFS 2017 server series.

If your software is dependent on a Windows-based UDF library, please contact us. We have already ported individual UDF libraries to Linux for several customers and can implement this for your software as an individual project.

Shadow Backup

In the basic configuration, we set up individual processes for each customer via remote maintenance, which typically transfers the entire database to the backup system hourly by means of a shadow backup. Should the master server fail unexpectedly, then a maximum 1-hour-old backup of the database is always available. A simple configuration file merely needs to be adjusted on the backup server, and the system restarted, in order to be able to immediately continue working on the backup server. If we cannot bring the former master server back up and running remotely, we will send an identical replacement unit, which usually arrives at the customer on the following working day. (Depending on customer location + 1-2 days.)

Simultaneously you return the defect device and keep the replacement unit, which we configure as the new backup system.

The backup system can also easily be used in the standard configuration for reporting purposes, provided the maximum 1-hour-old data is sufficient. In particular complex reports can preferably be run on the slave, so that the users on the production system do not suffer under the additional database load.

For the standard external data backups we perform daily backups on the IFS server via FTP and forward the scripts on to you, so that you can save these on your network.

Master-Slave Replication

We also offer an optional transactional real-time master-slave replication for almost any Firebird 2.5/3.0 database. Depending upon the complexity, we add further system objects in the database, so that each write operation on the master server is simultaneously written in the slave database. Should the master server fail, all committed transactions are present on the slave. The realization of this solution depends upon the complexity of the database structure, costs starting from $ 2,500.

Whilst all write operations have to take place on the master, the slaves can be used without any problems for real-time reporting purposes, as all data is also available in real time.

The master-slave replication can also be set up as a master multi-slave without any additional costs for optimal protection.

The data is replicated from an IFS master server to 2 or more IFS slave servers. However, it is vital in this case that all of the replication targets are our IFS servers, as the slowest system has a negative impact on the overall speed.

Multi-Master Replication

As part of individual customer projects, we can implement flexible multi-master replication systems according to your specific requirements. One of our customers works with the system implemented by ourselves, with synchronous/asynchronous bidirectionally-replicated IFS servers currently at 140 sites. Multi-master replication project budgets start at around $ 15,000. Do not be dazzled by simple replication tools for a few hundred dollars, with which you can supposedly quickly click something replication-like together. We have 15 years of experience with hundreds of sites and large data quantities. Please contact our sales team for an individual offer.

IFS Server 2017 prices

1 IFS Server 2017: 0.8 TB storage for Firebird 2.5/3.0 databases, 32GB RAM: $ 3,499
1 rack drawer 2HE including rails $ 199

Plus sales tax and shipping (shipping costs depend upon the delivery location).

Package offer

2 IFS Servers 2017 incl. 1 rack drawer 2HE including rails $ 6,999

Plus sales tax and shipping (shipping costs depend upon the delivery location).

Maintenance

Annual maintenance per IFS server $ 399, payable annually in advance.

IFS Server Evaluation

You are interested in evaluating our IFS servers, to compare the benefits with your own system?

We offer 2 paid options:

1. Hotline package with remote server maintenance:

Book our "120 minutes IFS 2017 Remote Test Hotline Package" for $ 260:

We'll make a Windows computer available in our computer center in a terminal session, where you can install your software with our help. Then you upload a suitable database as a backup file via FTP. As part of the hotline service, we will then import the database to the IFS 2017 server in the data center. Once the database is available, you can test your software on this machine to gain an impression of our hardware performance and capability. The database and the software in the terminal session are available for a maximum of 48 hours. We will then delete it immediately.

If, following the test, you order our package offer (2 servers plus rack drawer), we will deduct the costs of $ 260 for the hotline package from the total price.

2. Hotline package with remote maintenance and IFS server at your premises:

Book our "120 minutes IFS 2017 On-Site Test Hotline Package" for $ 399. We'll provide you with an IFS server with DHCP network settings delivered by parcel service (shipping costs to be borne by the customer).

After the server has arrived, connect it to your local network according to our specifications. We will then start the restore remotely on the IFS server from a suitable database backup. Once the restore is complete, you can configure your software to use the Firebird server on the IFS 2017 server and gain an impression of

our hardware performance and capability. Once the installation is complete, the server can remain at your premises for a maximum of 3 further working days.

If, following the test, you order our package offer (2 servers plus rack drawer), we will deduct the costs of $ 399 for the hotline package from the total price.

It is vital you return the test server to us within a maximum of 5 working days, to arrive at our company premises within 7 days following your receipt of the goods. The costs for the punctual and insured return shipment are to be borne by you. Should the server arrive late, we will invoice a daily compensation fee of $39 calculated from day 7 following your receipt of the goods, until the goods are received by ourselves. Should you wish to continue to use the test system until receipt of your ordered server(s), then this will be charged at these daily rates.

Following receipt each server is examined for possible damage. If the server is damaged electronically or mechanically, we will invoice you the current list price. Therefore please ensure that you adequately insure your shipping order to the amount of $ 3,500.

Which package is suitable for whom?

We recommend the first package if the database to be tested is not very large and the database can be uploaded to our server in our data center without any problems (<= 20GB).

We recommend the second package if the database to be tested is very large or if a file upload is not desirable or is not practical due to slow upload bandwidth.

We are happy to confirm on request a confidentiality agreement regarding data protection and guaranteeing the secure deletion of all data from our server following completion of the test.

Please contact sales@ibexpert.com for further details and a written offer with a proposed dates for the test evaluation.

Please understand that we cannot offer free IFS evaluations and that dates will be offered on a waiting list basis, due to the limited availability of the evaluation systems.

An order can of course be placed at any time without prior evaluation.

All prices excl. sales tax.