

# HQbird 2024 Description

This document explains how HQbird enhances Firebird's technical capabilities and how software development companies and large enterprises can benefit from using HQbird.

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## What is HQbird?

HQbird is a distribution of the Firebird DBMS for enterprises from IBSurgeon Software ([www.ib-aid.com](http://www.ib-aid.com)), which includes additional functions that mainly improve performance for large and highly loaded databases, and a set of tools for organizing a full cycle of database maintenance without a DBA (including tools for performance optimization, monitoring, local and cloud backups, and recovery in case of failures).

HQbird speeds up the performance of large databases (from 50 GB to 2 TB) and enables companies to manage large databases without requiring a dedicated database administrator for a few servers, or lowering support expenses for many (hundreds and thousands) Firebird servers.

The minimal hardware requirements for HQbird are 8Gb RAM and 4 cores. The first version of HQbird was released in 2015, the current version is HQbird 2024.

## How is Firebird related to HQbird?

To put it simply, HQbird is an enterprise version of the open-source Firebird DBMS. In keeping with the tradition of open-source projects, we call Firebird the “vanilla” version: in the same way, there is a “vanilla” version of PostgreSQL and commercial versions of EnterpriseDB, PostgresPro, etc.

HQbird is not a “different” database in terms of compatibility with Firebird: there is no need to make a backup-restore when switching between HQbird and Firebird, no need to rewrite SQLs or change client applications.

Without any problems, you can install HQbird and the vanilla version of Firebird in parallel on the same server, work with the database file using HQbird, then switch to the vanilla Firebird, and vice versa.

HQbird's 100% compatibility with vanilla Firebird is the most important feature of HQbird!

Almost all functions that are developed for HQbird end up in Firebird within 1-2 versions: for example, replication appeared in HQbird for version 2.5, and it appeared in vanilla version 4.0, external connection pooling was developed in HQbird 3.0, and appeared in Firebird 4.0, multi-threaded backup, restore, sweep capabilities appeared starting with HQbird 2.5, and became available in vanilla Firebird 5.0, etc.

In addition to the new functionality, bugs fixed in HQbird are also fixed in the corresponding versions of vanilla Firebird.

Also, IBSurgeon Software provides public testing of Firebird and HQbird in terms of reliability and performance: the testing results are published on the website [www.firebirdtest.com](http://www.firebirdtest.com).

## What is the price of HQbird?

The permanent license for 1 server is USD\$899. It also includes 1 replica server license.

What will be the price of HQbird for a company that needs to use not 1 or 2 servers, but several hundred or even thousands of installations?

If the number of servers is more than 20, purchasing permanent licenses (USD899/server) becomes too expensive. That's why we offer HQbird Unlimited Subscription for software development companies.

HQbird Unlimited Subscription for software development companies costs USD\$1200/month (or USD\$13450/year with upfront payment), for the annual contract (please note, that regional pricing can be different).

This is a special license for software development companies that allows you to install and use an unlimited number of HQbird copies along with business applications (ERP, CRM, etc) produced by the company.

For example, if a company has 40 clients, then the subscription will cost USD\$1200/month, that is, approximately \$30 per client per month. If the software development company has 400 clients, then the cost for 1 client per month will be \$3 per month.

## HQbird Features

### 1. High-performance native replication

HQbird includes native replication to create fault-tolerant systems based on Firebird databases:

- Replicates databases with 1500+ connections
- Asynchronous replication with 1-30 seconds delay,
- Synchronous replication without delay,
- No triggers or other changes in schema required
- Automatic propagation of DDL changes,
- Online re-initialization of replicas.
- Embedded transport for replication changes, verification of transferred replication segments

Native replication is configured through the special plugin, with the ability to exclude records without PK/UK at the plugin level.

HQbird has complete transport to arrange transfer of segments for asynchronous replication for 1-to-1 or 1-to-many schemas, with automatic setup, transfer and validation of replication segments via sockets or FTP. HQbird has command-line commands to set up databases for replication in bulk, to choose databases in the folder, or in nested folders.

See more details:

- Detailed description <https://ib-aid.com/en/hqbird-enterprise-test>
- 5 Min Video “How to set up asynchronous replication in HQbird”  
<https://youtu.be/bYuyTcmKbho?si=JOqdrp1EfT4xd3ND>
- HQbird User Guide <https://ib-aid.com/download/docs/hqbirduserguide/userguide.html?v=2024>

### 2. Replacing queries "on the fly"

If you have an application with inaccessible or missing sources, HQbird can help you change texts of incompatible or most resource-consuming SQL queries “on the fly”, and therefore help to optimize the performance or migrate an application without SQL queries sources.

The replacement is easy configurable, it is implemented by pairs of files which contains text of original and replaced queries.

With Advanced Monitoring (see below #14), you can find SQL queries that cause issues and then configure the substitution for them, even without access to the application's source code.

The replaced query will occur in trace and MON\$ tables with the new text.

### 3. Plugins for performing external connections with MySQL and ODBC

HQbird has External Datasource plugins for ODBC and MySQL.

Using these plugins, it is possible to execute commands “Execute Statement On External” with queries to MySQL or ODBC data source, in order to read data from external datasources, or to write data to external datasources.

Plugins support input parameters and correct mapping of data types (however, in case of ODBC it depends on the specific driver implementation).

See example of an external connection below:

```
execute block
returns (
  emp_no bigint,
  birth_date date,
  first_name varchar(14),
  last_name varchar(16),
  gender char(1),
  hire_date date
)
as
declare dsn_mysql varchar(128);
begin
  dsn_mysql = ':mysql:host=localhost;port=3306;database=employees;user=root';

  for
    execute statement q'{
      select
        emp_no,
        birth_date,
        first_name,
        last_name,
        gender,
        hire_date
      from employees
      order by birth_date desc limit 5
    }'
    on external dsn_mysql
    as user null password 'sa'
  into
    emp_no, birth_date, first_name, last_name, gender, hire_date
  do
    suspend;
end
```

## 4. Caching blobs in temp space

HQbird can cache BLOBs in temp space, in order to speed up BLOBs operations (+15%-200% faster than in vanilla Firebird), and to prevent growth of the database file in case of mistaken BLOB operations.

HQbird uses an extra firebird.conf parameter BlobTempSpace to control this feature.

The caching option can be:

- 0 - disabled,
- 1 - enabled for PSQL (default),
- 2 - enabled for all blobs operations.

## 5. Improvements in optimizer for JOINS and large sortings

### 5.1. LeftJoinConversion / OuterLeftConversion

HQbird can automatically convert implicit inner joins to explicit ones for better optimization in versions 3 and 4.

To activate this feature, change the LeftJoinConversion setting in firebird.conf to “true”.

HQbird in v5.0 supports the OuterLeftConversion option that is available in the vanilla version 5.0.

### 5.2. SortDataStorageThreshold/InlineSortThreshold

HQbird can optimize queries that involve large sorting operations. In versions 2.5 and 3.0, you can use the SortDataStorageThreshold setting to activate the Refetch plan for this purpose. In the vanilla version 4.0, this setting is renamed as InlineSortThreshold.

Usually, we recommend to set SortDataStorageThreshold to 8192 or 16384 bytes.

## 6. Cache of compiled queries

This feature can improve the performance of repeated queries, especially when using a connection pool (PHP, etc).

Cache keeps a certain number of prepared queries in each connection's memory. HQbird has this cache in versions 3.0 and 4.0, and you can adjust it with the DSQLCacheSize setting (default is 0, i.e., disabled).

In vanilla version 5.0, there is a comparable feature, regulated by the MaxCompiledCache option, which is measured in Megabytes, the default is 2Mb.

## 7. Streaming/Change Data Capture (plugins for Kafka, JSON, etc)

Change data capture is a method that tracks the modifications in a database and sends them to another system, such as a Kafka, JSON files, RabbitMQ, full text search plugin, etc.

HQbird offers a change data capture plugin, which relies on replication. The plugin produces a stream of changes that reflects the commits/rollbacks of transactions.

HQbird provides pre-built plugins for Kafka, RabbitMQ, JSON files, and also supports customizing them for any destination.

CDC is useful for handling queues, sending alerts asynchronously, and copying changes to other systems (such as BI or data processing pipelines).

CDC plugin is shipped by request, please contact IBSurgeon Support ([support@ib-aid.com](mailto:support@ib-aid.com)) to get more information.

## 8. Full-text search

Full-text search is a technique that allows you to search for any word or phrase within a large collection of documents or data. Full-text search is different from searching based on metadata or partial text, which may not capture the full meaning or context of the query. Full-text search uses a full-text engine, such as Lucene, to perform the search and return the results.

IBSurgeon Full Text Search UDR is a user-defined routine (UDR) that integrates Lucene with Firebird. A UDR is a custom function that can be called from SQL statements. IBSurgeon Full Text Search UDR allows you to perform full-text search on Firebird tables in varchar and BLOB fields using Lucene engine.

This UDR is available in open source, but HQbird, provides a customizable plugin based on streaming for operational update.

- More details: <https://www.firebirdsql.org/en/full-text-search-udr/>

## 9. Multi-threaded backup, restore, sweep, creation of indices

HQbird implements multi-thread maintenance (sweep), backup, restore, and create index operations. Firebird 2.5, 3.0 and 4.0 are supported, and this functionality also appeared in Firebird vanilla version 5.0.

The format of backup files is the same as in the vanilla Firebird. On the test server with CPU with 8 cores and SSD, we have the following results (compared with 1 thread);

- **Backup** — 4- 6x times faster
- **Restore** - 2-4x time faster on CPUs with 8 cores and SSD
- **Sweep**- 4-6x time faster

The actual acceleration depends on CPU, disk subsystem of the server, and structure of the database. Install HQbird in the trial mode (up to 30 days) and check what results will be on your server!

More details and test results can be found here: <https://ib-aid.com/articles/firebird-gbak-backup-tips-and-tricks#110hqbirdbackup>

## 10. Parallel reading of consistent data

HQbird, starting from version 2.5, supports two important features:

- 1) `make_dbkey()` function, which enables reading a table that is partitioned by physical storage blocks (pointer pages),
- 2) and “shared snapshot” transaction mode, which facilitates parallel operations in multiple connections.

These features help to achieve parallel reading of large data sets, and to accelerate 2-10x times export operations (such as for BI exports or data pipeline).

These features are also available in Firebird vanilla, from version 4.0.4 onwards.

- More details are in the article: <https://ib-aid.com/articles/parallel-reading-of-data-in-firebird>
- Example application & sources: <https://github.com/IBSurgeon/FBCSVExport>



## 11. Pool of external connections

HQbird has a pool of external connections for Firebird 2.5, 3.0, and this pool is also available in vanilla version since 4.0.

This pool supports running parallel EXECUTE ON EXTERNAL statements to other Firebird databases, and, as a result, improves speed of frequent external queries.

The feature is controlled in the firebird.conf with ExtConnPoolSize and ExtConnPoolLifeTime parameters.

From the application perspective, no extra steps are needed to use or not use — it is switched on or off in the server configuration, and completely transparent for the applications.

It is also possible to disable garbage collection for queries executed in external connections. It is regulated through configuration parameter ExtConnNoGarbageCollect.

- More details: [https://ib-aid.com/download/docs/hqbirduserguide/userguide.html?v=4#\\_pool\\_of\\_external\\_connections](https://ib-aid.com/download/docs/hqbirduserguide/userguide.html?v=4#_pool_of_external_connections)

## 12. Encryption

HQbird supports encryption with Encryption Framework's Plugin. The main features are:

1. DB encryption plugin (available on demand) for versions 3, 4, 5, Windows & Linux. Comprehensive and fast encryption plugin framework, with AES256. Performance loss is between 4%-20%, depending on the RAM and configuration.
2. Support for multi-thread work (for middleware applications, with connections to multiple databases).
3. Sending keys through fbclient.dll to implement encryption without changing the application. If you have a database tool that does not support key transfer, or a third-party application, key can be sent through fbclient.dll with a special configuration.
4. Password input window for fbclient.dll in Windows and password input on the terminal in Linux.

We can offer examples of client applications in various languages, such as Delphi, NET, Java, PHP, C++, etc., upon request.

## 13. Automatic correction of firebird.conf (DefaultDbCachePages)

Incorrect configuration of DefaultDbCachePages in firebird.conf, databases.conf or in database header is a common configuration mistake, which often happens during the migration between versions. For instance, it can be too large values of Page Buffers in database header for Classic or SuperClassic, or too low for SuperServer.

HQbird will automatically fix the wrong setting in firebird.conf and databases.conf and it will overwrite, if the configuration is unsuitable for a selected architecture.

## 14. Advanced Monitoring of Performance (trace, MON, locks, CPU, RAM, frequency)

Advanced Monitoring of Performance in HQbird is a feature that allows you to monitor and analyze the performance of your Firebird databases (version 5.0, 4.0, 3.0, 2.5) in real time.

It collects data from various sources, such as Trace API, MON\$ tables, lock table, transactions, CPU and RAM usage, and displays them in graphical and tabular forms.

You can see the overall performance trends, as well as drill down to the details of each minute, query, or transaction.

You can also identify performance problems, such as slow and frequent queries, long-running transactions, lock table spikes, etc., and view their plans and statistics.

- More details: <https://ib-aid.com/monitoring-in-hqbird>
- Video: <https://www.youtube.com/watch?v=GuRmHZ8ErZ4>

## 15. Monitoring of queries with large sortings

This feature helps to troubleshoot queries that produce large reports, where many records need to be sorted. HQbird can track queries and operations that create sorting files larger than a given size.

When such a query is detected, its text is recorded to firebird.log

Configured as a TempSpaceLogThreshold parameter in firebird.conf, which defines the size of the sorting file for monitoring.

## 16. Manage (and configure replication) many databases at once with command-line tools

If you have many databases stored in the folder, and want to register all of them in HQbird to setup replication, in HQbird v2024 there is new command-line command to generate JSON file from the folder (recursive or not) with the registration information, which can be used for mass registration.

From replica side, there is special version of HQBird Central for Replicas, which allows to store hundreds of replicas (from different servers) on the single server. HQbird Central for Replicas is shipped by request.

## 17. Backups, Restore, and Automatic Backup/Restore

1. Backups: HQbird implements all types of backups with sophisticated or simple scheduling (all can be done online, with connected users):
  1. Verified backup with gbak.exe. The traditional Firebird backup format when Firebird reads every record in the database, guaranteeing that database is healthy. In HQbird (versions 2.5-5.0) verified backup is very fast due to multi-thread support. HQbird implements rotation of verified backups, compression, and test restore. HQbird calculates necessary space for backups to ensure that backup will fit into the free space, and creates detailed logs for all operations.
  2. Incremental backup. The fast physical level backup which copies changed data pages. HQbird offers 3 backup schemes: simple weekly 3-levels backup, enhanced multi-level backup (up to 5 levels), and dump backup to create a copy of the database. Backup files are rotated, the necessary space is calculated.
2. Restores
  1. Restore your databases from backups. HQbird allows to restore database from FBK. It is especially important for cloud instances, when FBK is uploaded to the cloud instance, so there is no necessity to connect to server's console (i.e., ssh or RDP).
  2. Test restore, as part of verified backup process. You can opt to perform test of restore of fresh backup, it will be done as a part of verified backup restore process.
  3. Scheduled restores. It is possible to organize scheduled restores of verified (gbak) backups and/or incremental (nbackup) backups, for example, as part of backup infrastructure.

3. Automatic backup-restore. Support of full backup-restore cycle, both planned and by request. HQbird will do the full backup-restore in the safe and fast manner: stop all users, do backup and restore, enable users. The old copy of the database will be kept. In case of a problem the process will be reverted. If there will be not enough space, backup-restore will not start.

With HQbird, you can always keep track of your backups and avoid losing them, no matter how many databases you have or where they are.

## **18. Transfer backups, segments, etc through FTP/sockets/Amazon S3**

HQbird can transfer backups (or other files by mask) via FTP, sockets, or to Amazon S3 (needs plugin which is available on demand).

HQbird also has built-in FTP server and sockets server with easy setup.

## **19. Advanced maintenance: proper garbage collection and more**

Excessive record versions, also known as garbage versions, slow down Firebird databases significantly.

HQbird implements the proper combination of sweep operations and “soft” shutdown of long-running writeable transactions, and allows to avoid frequent database backups/restores. With HQbird it is recommended to do backup/restore no more than once per year.

Maintenance can also include the recalculation of indices statistics and the verification of indices health, as well as the examination of metadata health.

## **20. Multi-instance support**

HQbird allows installation of multiple Firebird instances of different versions on the same server. It makes migration from one version to another easier. HQbird for Windows installs all supported Firebird versions (5.0, 4.0, 3.0, 2.5) by default, each instance with a different port. You can choose to install only one version, or several versions, during the installation.

To install HQbird for Linux with multiple instances, please use united installer (it is a new feature of HQbird v2024), and indicate what versions you want.

## **21. Silents installation on Windows and Linux**

The fastest way to install HQbird is to use the silent installation in the command line.

In the example below we will install HQbird with Firebird 3.0 into c:\HQbird, the configuration will be c:\HQbirdData\config, output in c:\HQbirdData\output.

```
HQbirdServer2024.exe /VERYSILENT /SP- /TYPE="hqbird30x64" /DIR="C:\HQbird2020" /CONFIGDIR=C:\HQBirdData\config /OUTPUTDIR=C:\HQBirdData\output
```

How to setup on Linux: <https://ib-aid.com/en/hqbird-installation/#linux>

More details: <https://ib-aid.com/hqbird-installation#silent>

## 22. Tool to analyze database statistics

HQbird's Admin package (it runs on Windows), includes Database Analyst, a tool that assists a user to analyze in detail Firebird database statistics and identify possible problems with database performance, maintenance and how an application interacts with the database. IBAnalyst graphically displays Firebird database statistics in a user-friendly way and highlights the following problems:

- tables and BLOBs fragmentation,
- record versioning,
- garbage collection,
- indices effectiveness, etc

More details: [https://ib-aid.com/download/docs/hqbirduserguide/userguide.html?v=4#\\_hqbird\\_struct\\_analyze](https://ib-aid.com/download/docs/hqbirduserguide/userguide.html?v=4#_hqbird_struct_analyze)

## 23. Tool to analyze connections/transactions/memory consumption/IO operations

HQbird MonLogger is a tool to analyze monitoring tables output in Firebird and find problems with slow SQL queries, wrongly designed transactions (long-running transactions, transactions with incorrect isolation level, etc) and identify problematic applications.

MonLogger can connect to Firebird database with performance problems and identify what is the reason of slowness: is it some user attachment, slow SQL query or long-running transaction?

MonLogger supports Firebird 2.1, 2.5, 3.0, 4.0 and 5.0 – for older Firebird versions or InterBase please use FBScanner.

MonLogger can show you:

- Top attachments with highest number of IO operations, non-indexed and indexed reads
- Top SQL statements with highest number of IO operations, non-indexed and indexed reads
- Problematic transactions: long-running transactions, transactions with erroneous isolation level, read/write transactions, and related information: when they started, what applications started these transactions, from what IP address, etc
- Attachments and statements with the most intensive garbage collection actions
- Read/write ratio, INSERTS/UPDATE/DELETE ratio, and more.

## 24. Recovery tools

HQbird includes license of FirstAID, recovery tool for Firebird. IBSurgeon FirstAID is the tool that can automatically diagnose and repair corrupted Firebird or InterBase databases - it can recover corruptions that neither gbak nor gfix can fix. Supported versions: Firebird 1.0, 2.0, 2.1, 2.5, 3.0, 4.0, 5.0, InterBase from 4.0 to 2020.

It uses its layer for low-level database access without using the InterBase or Firebird engine, so it can perform real "surgical" operations and repair your database when all other standard mechanisms (gfix and gbak) cannot.

## 25. Optimized configurations

HQbird comes with the optimized configuration by default to make the best use of resources of powerful servers and Virtual Machines. To improve HQbird configuration, you can use Configuration Calculator for Firebird, where you can choose "HQbird", to obtain the basic optimized configuration for your system here: <https://cc.ib-aid.com/democalc.html>.

Please note that Calculator produces conservative configurations, and to create customized configuration, you need to monitor and analyze performance logs.

IBSurgeon can assist you to create the ideal configuration in the context of Optimization/Configuration/Audit Incident for Firebird:

<https://ib-aid.com/en/firebird-interbase-performance-optimization-service/>

## How can HQbird reduce costs for large companies and software development companies?

Let's see how HQbird can recoup its cost, and in some cases, even create a new source of revenue.

There are 3 main advantages of HQbird for enterprises:

1. **Speed: Speeding up Firebird databases**
2. **Protection: various types of backups, backup to the cloud, replication (including “mirror” in the cloud), data protection from theft (using encryption)**
3. **Mass maintenance and monitoring (1 admin per 1000 servers).**

### Speed: Speeding up Firebird databases

HQbird is faster than vanilla Firebird due to

- a) better configuration,
- b) improved core performance, features such as external connection pooling, blob optimizations, multi-threaded parallel operations, and other features,
- c) optimizer improvements (including optional ones),
- d) Eliminating the problem of accumulation of redundant and garbage versions of records through proper database maintenance,
- e) Functionality extensions (streaming, functions for working with blobs, etc.).

**Replica!** *The easy way to speed up the system is to create a read-only replica (mirror) of the main database and transfer there all reports and interactions with third-party applications (export to BI applications, for example).*

*HQbird provides tooling for organizing a **native replica** (which transmits DDL, has no problems with generators and, most importantly, unlike replication on triggers, has very high performance).*

By simply installing HQbird instead of vanilla Firebird, without modifications to the application, many users immediately notice improved performance.

An even greater effect can be obtained if you use HQbird's advanced monitoring capabilities, identify problematic queries, configurations and applications, and fix them (with new indices, database structure's optimization, configuration workarounds, and SQL optimization).

*We (IBSurgeon) also offer a performance optimization service based on HQbird as an additional service: <https://ib-aid.com/en/firebird-interbase-performance-optimization-service/>*

The performance improvement is especially noticeable for large databases that have reached some of the bottlenecks and therefore cannot use the powerful hardware/VM effectively.

### ***How does investing in database acceleration pay off?***

1. Increased customer satisfaction due to improved applications performance. Customers are not annoyed anymore by freezes and slowness of applications, they are stop losing money due to delays, and, therefore, stop planning to leave for competitors.
2. Savings on purchasing hardware or renting virtual machines in the cloud. Direct savings on improving the underlying performance of the DBMS are especially noticeable in the case of VM rental, when instead of 32 cores, you can rent a VM with 16 cores.
3. Savings for developing a new version of the application on a different, supposedly faster DBMS. Unfortunately, many application developers, having encountered a performance problem, begin to try to find a solution by migrating to another DBMS, far from exhausting the capabilities of Firebird, which is mistakenly considered as a “database for small projects”. HQbird is much cheaper, faster and easier solution than migration to other DBMS.

### **Protection: various types of backups, backup to the cloud, replication (including “mirror” in the cloud), data protection from theft (using encryption)**

Many clients have lost their data due to server failures, problems with virtual machines and, especially, due to encryption viruses (ransomware). HQbird has all necessary backup solutions.

HQbird also offers solutions to the problems of physical theft of database files and unauthorized access to the database (for example, directly access data using development tools).

#### ***Backups in HQbird***

HQbird implements several types of backups, based on gbak (multi-threaded verified record-level online backup) and incremental backup with nbackup (physical page-level online backup), with the ability to rotate backups.

Incremental backup has 3 options: a dump (a quick online copy of the database file, suitable for a combination with VM level backups and deduplication backup software), a simple nbackup schedule (within a week), and an extended schedule (CRON).

HQbird analyzes backup logs to ensure the success of the backup and optionally performs a test restore.

HQbird also can compress backup copies (including native compression since version 3.0) and can encrypt compressed copies.

#### ***Backups and Replicas in the cloud***

HQbird can send backups to FTP or Amazon S3 (requires a plugin, available upon request).

The replication mechanism (starting from version 2.5 in HQbird) allows you to organize a replica copy of the database in the cloud within 30 minutes if you use ready-made images, for example, Digital Ocean, which already has a ready-made VM image with HQbird.

HQbird has read-to-use images of VMs in DigitalOcean (worldwide) and SaveInCloud (Brazil), which you can create and start in less than 5 minutes.!

In DigitalOcean, choose what version do you wish to start:

HQbird with Firebird 5.0: <https://marketplace.digitalocean.com/apps/hqbird-firebird-v5.0>

HQbird with Firebird 4.0: <https://marketplace.digitalocean.com/apps/hqbird-firebird-v4.0>

HQbird with Firebird 3.0: <https://marketplace.digitalocean.com/apps/hqbird-firebird-v3.0>

HQbird with Firebird 2.5: <https://marketplace.digitalocean.com/apps/hqbird-firebird-v2.5>

In SaveInCloud, use this link to open dialog and choose HQbird with desired version in the dropdown list:

SaveInCloud panel: <https://app.jelastic.saveincloud.net/?jps=hqbird>

As a result, you will have preconfigured HQbird with desired Firebird version running, then you can upload there your database files (or backups) and add it to HQbird.

The synchronization delay to deliver data to a cloud replica will be around 30-120 seconds.

### ***Database encryption***

HQbird, starting from version 3.0, optionally supports database encryption in AES256 format. The performance degradation of encrypted is small, depending on the Firebird settings and the performance of the server or virtual machine: with adequate hardware and proper settings 4-5%, in the worst scenario up to 20%.

HQbird also supports encrypted database backups.

To access the database through tools that do not support key transfer, there is a mechanism in HQbird to load an encryption key through the client library fbclient.dll.

For client applications on Windows without the source code, it is possible to enter a password to access an encrypted database without modifying the application - the dialog will be launched in the client library.

### ***How does investing in protection against failures and data theft pay off?***

A number of software development companies have implemented, using the backup functionality of HQbird, the additional service “Backup in the Cloud”, which they offer to their clients for a small additional fee.

In general, having a backup outside the office (in the cloud or in another office) is now the standard for all office applications.



However, it would be a big mistake to use file backup software and virtual machine backup software for database backups (any database, not just Firebird), since backing up database files requires a special approach.

A large number of clients use database encryption to comply with GDPR requirements.

Also, it is often a good idea to have an additional protection against theft of the database file and unauthorized access to the database.

## **Mass maintenance and monitoring (1 admin per 1000 servers)**

### ***HQbird Control Center***

The HQbird Unlimited Subscription license includes the HQbird Control Center, a tool that centralizes monitoring data for all HQbird installations and allows you to see the status of hundreds of servers on one page.

By centralizing information about errors (backups, database corruption, lack of space, etc.) and performance issues, a large company can significantly reduce the cost of monitoring and maintaining a large number of servers, since even a single technical support employee can monitor a very large number of servers.

With HQbird Control Center, you do not need to connect to the console of each server to assess the situation, that is, whether the server or database requires any intervention, what warnings HQbird generated and what is recorded in firebird.log and replication.log, whether the backup was completed successfully, and whether there was any problem with free space or database corruption.

### ***Bulk installation and update of HQbird***

Installing and updating software on a large number of servers is always a difficult task, so the HQbird installer supports a “silent” installation mode and a “silent” update mode.

### ***Automatic maintenance***

Firebird has always been known as a database management system that does not require an administrator. However, when the database grows to a size of 100-500-1000GB, standard maintenance tools are not good enough, and if you still want to save on a dedicated administrator, then you need to use HQbird.

HQbird implements the proper combination of sweep operations and “soft” shutdown of long-running writeable transactions, and allows to avoid frequent database backups/restores. With HQbird it is recommended to do backup/restore no more than once per year.

HQbird also implements a fully automatic backup-restore task, with all necessary precautions.

Speeding up backup and restoring by 4-6 times thanks to multi-threaded operations (available in HQbird from version 2.5, in vanilla Firebird from version 5.0) also reduces maintenance time.

HQbird also can reduce space requirements by compressing backups (starting with HQbird 3.0 and vanilla 4.0, native compression is available with the -zip option).

## ***How does an investment in mass database maintenance pay off?***

It's very simple — increase customer satisfaction and reduce technical support costs.

## **Other HQbird features important for large companies**

### ***Migration Framework***

The Firebird Mass Migration Framework is an integrated suite of tools and guidelines designed to automate a substantial portion of the Firebird migration process. It provides a streamlined methodology for automating of Firebird migration workflow.

See more details here: <https://ib-aid.com/mass-migration-framework-for-firebird>

### ***Additional protection against failures***

1. High Availability. Starting from version HQBird 2.5, you can create a database replica, which can be located either on another server (for example, in the cloud), or locally, in order to create a “hot” backup. In the event of an emergency, data loss will be limited to the last few records and outage can be a few seconds (requires custom implementation).
2. Database recovery tools are included in the distribution: FirstAID, IBBackupSurgeon, IBUndelete

### ***Cloud and Docker***

1. HQbird is ready to work in the cloud - all key actions with databases can be carried out through the web console interface, the configuration is optimized for working on a VM.
2. There are ready-made images of HQbird on Digital Ocean (publicly available), SaveInCloud (Brazil) (publicly available), Amazon (available upon request), and a Docker image (available upon request).
3. HQbird has ready to use Docker images (supplied by request).

### ***Streaming: sending changed data to Kafka, RabbitMQ, Mongo and JSON/text files***

HQbird, starting from version 3.0, has the ability to asynchronously send table changes to external sinks, for example, RabbitMQ, Mongo, or just text files.

It is enough to configure HQbird by specifying which tables we want to track, which operations we want to send (INSERT/UPDATE/DELETE), and specify the data sink plugin.

This functionality works on top of the changes created by the replication engine, so all changes to all tables are included in it, regardless of the SQL command that caused the changes.

***Access from PSQL (stored procedures, triggers, Execute Block) to other DBMS (MySQL, ODBC) through the Execute Statement On External mechanism***

HQbird, starting from version 3.0, can access other databases, for example, MySQL, in order to execute SQL queries in an external database. Parameter passing and return data type matching are supported.

**Summary**

HQbird combines all the advantages of Firebird and the functionality needed to work with large databases with a heavy load.

If your company develops Firebird database applications and has more than 20 servers with fairly large databases, contact us. We will help you build a solid foundation for effective use of the Firebird DBMS for years and terabytes to come.

Contact us now: [support@ib-aid.com](mailto:support@ib-aid.com)