

Firebird databases recovery and protection for enterprises and ISVs

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About IBSurgeon

IBSurgeon



- Tools and consulting
- Platinum Sponsor of Firebird Foundation
- Founded in 2002
- Based in Moscow, Russia, world-wide 24x7 support

www.ib-aid.com

www.ibsurgeon.com

Agenda

1. How to recover Firebird database?
2. Is Firebird Reliable?
3. What happens when database crashes
4. Standard means to recover database
 - Tips and tricks
5. IBSurgeon Tools for recovery and protection
 - HQbird FBDataGuard

HOW TO RECOVER FIREBIRD DATABASE?

Overview of Firebird recovery approach

- Recovery contains 2 phases:
 - Diagnostics and choice of recovery method
 - Recovery phase:
 - With standard means: gfix+gbak
 - With [IBSurgeon FirstAID](#) (commercial Firebird recovery tool)
 - Direct Fix
 - Export of good data
- Read comprehensive Firebird Recovery Guide
 - http://ib-aid.com/download/docs/firebird_firstaid_recovery_guide.pdf
- Now let's discuss Firebird recovery with FirstAID in more details

IBSurgeon FirstAID: Direct Fix



- Scan internal structure and finds inconsistencies
- Replace/restore lost system pages where it is possible
- Delete wrong pages and dead records
- Fast!
- Effective for user's data corruptions
- Try it now:

<http://ib-aid.com/en/ibsurgeon-firstaid/>

IBSurgeon FirstAID: Data extraction

- Reads metadata from database and read records bypassing server
- Free preview of records is available
- Exports all good records to the new database
- Resolves dependencies
 - Foreign Keys, Triggers, UDFs
- Speed is 1Gb/hour
- Very effective! (up to 95% of successful recoveries)

FirstAID: borrow external metadata

- FirstAID can borrow metadata from **good healthy database with the same structure** and export data from corrupted one, even **if all system data lost!**

How to avoid corruptions?

- Better prevent than fix!
- Enhanced monitoring and alerts

- Let's consider the corruption problem in more details...

IS FIREBIRD RELIABLE?

Is database corruption a problem only for Firebird?

- All databases are being corrupted from time to time:
 - MSSQL
 - www.google.com/search?q=MSSQL+database+corruption
 - Oracle
 - <http://www.google.com/search?q=Oracle+database+corruption>
 - MySQL, MS Access, DB2, Sybase, etc, etc (and InterBase)

Corruption is a matter of statistics

- HDD fails
- RAM fails
- ...
- Automobiles fail
- Electronics fails
- Space shuttles fall

The same is for hardware & software combination we use with Firebird



How to live in “corrupted” world?

1. This is **impossible** to exclude (prevent) corruption at all (if you are not God)
2. Realistic approach is **to decrease the chance** of corruption – i.e., increase system stability,

Common reliability levels are: 99%, 99.5%, 99.9%, 99.99%, etc

Examples of reliability

- 99%

- It's 3 days stop of your business (e.g., December 23-25)

- 99,5%

- About 1 day stop

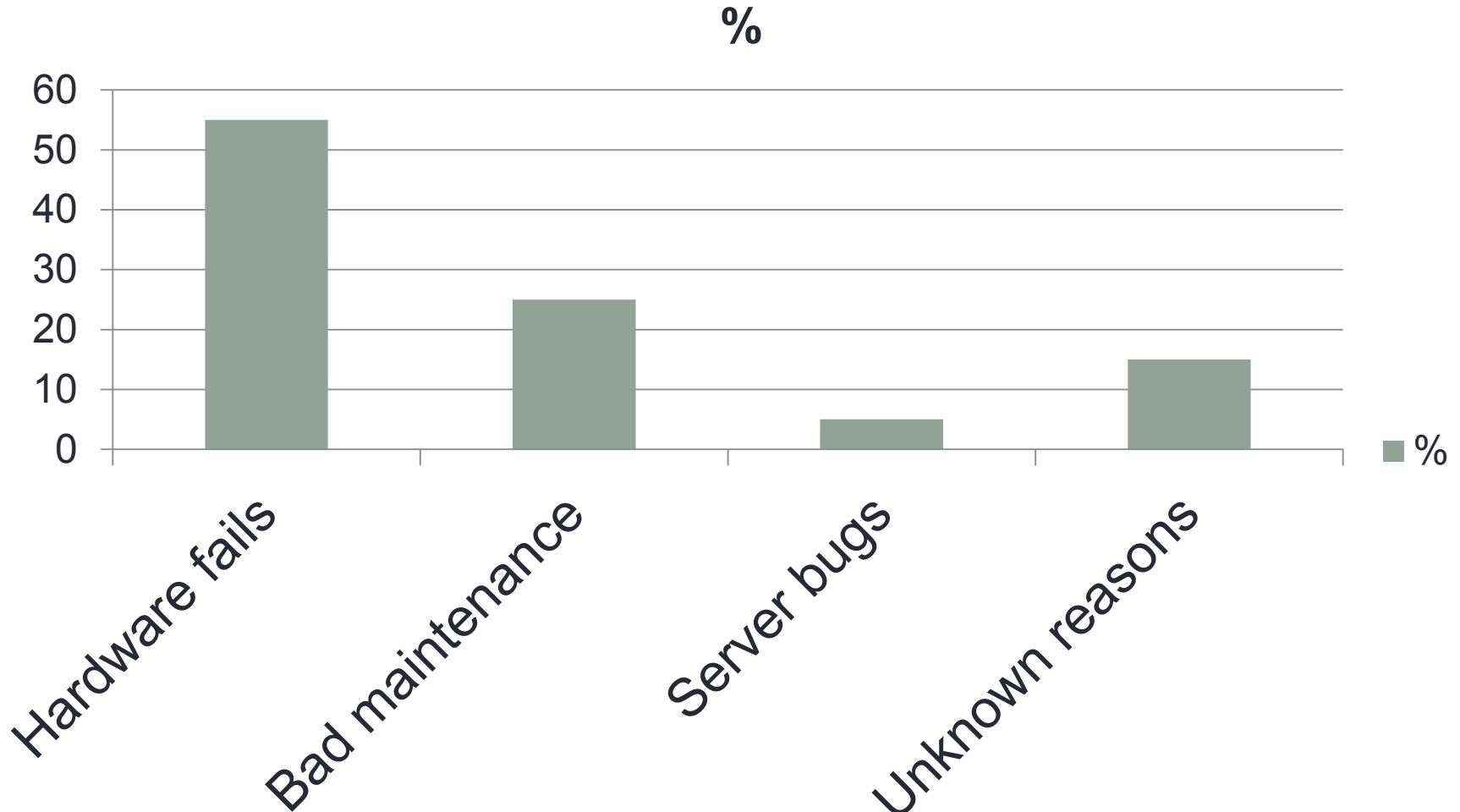
- 99,9%

- 3.5 hours stop

- 99,99%

- 20 minutes

Why Firebird corrupted?



Firebird stability levels

- How to achieve 99,5%
 - Use good hardware with RAID
 - Perform backup/restore or proper maintenance every day
- How to achieve 99,9%
 - Implement failover-cluster based on [replication](#)
 - Monitor your Firebird database

It's much easier and cheaper to achieve high reliability for Firebird than for other databases.

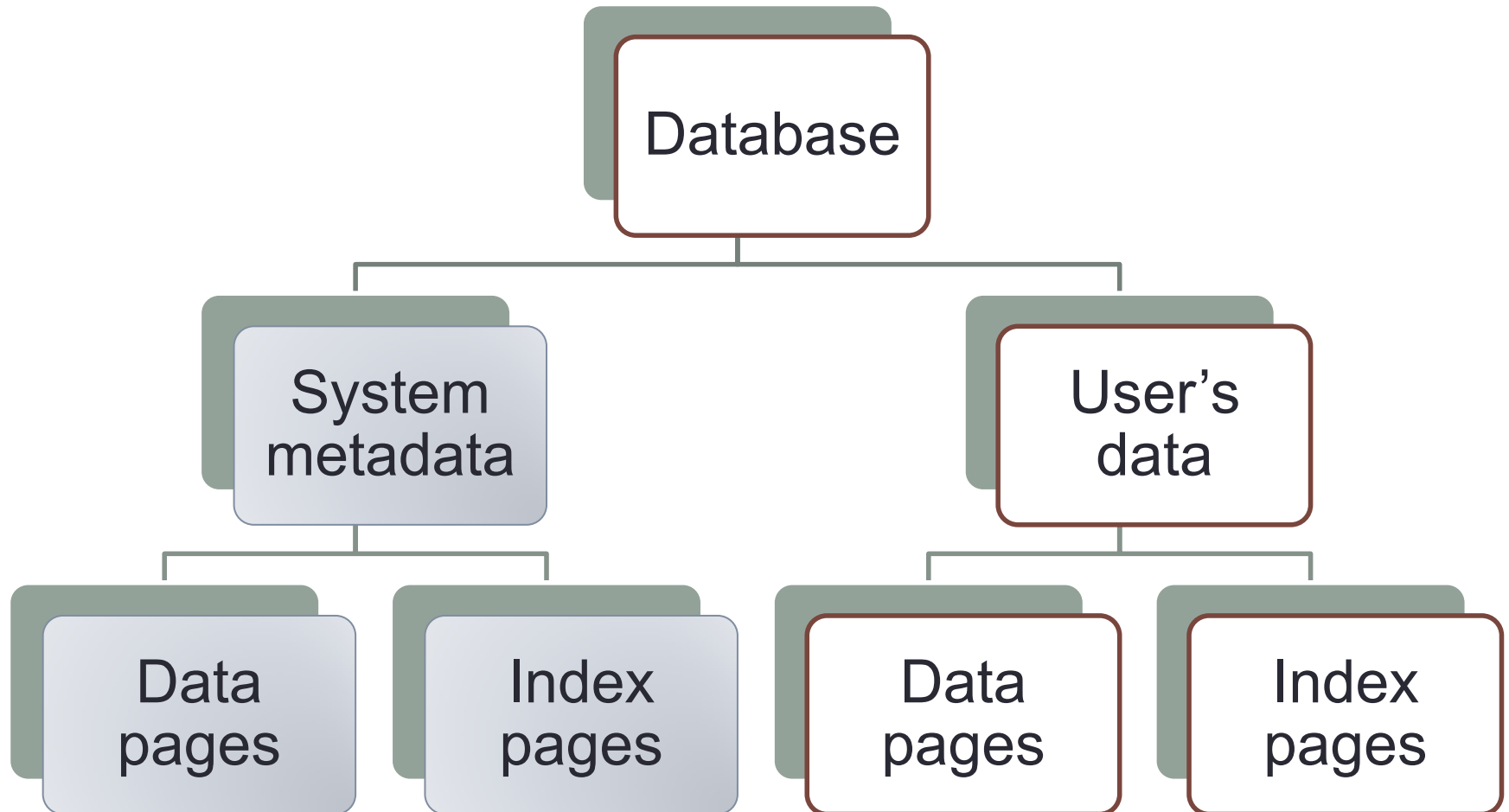
Yes, Firebird is reliable!

But it happens...

- No backups
- No administrator
- Serious hardware fails
- Big database and 24x7 – we can't do backup/restore everyday
- What to do?

WHAT HAPPENS WHEN DATABASE CRASHES?

Firebird inside looks like a forest...



...with only 2 trees

- System data pages
 - Contains information about tables, indices, stored procedures. This information is used to store and read user data pages
- User data pages
 - Contains actual users data
- Indices?
 - Indices always can be recreated
 - System indices can be a problem

What corruption means for Firebird?

- For some reason Firebird engines cannot read one or several pages and fails to build database image
 - For HDD corruptions - many pages
 - RAM corruptions – few pages

Corruptions appear at:

1. Users screen (“internal Firebird software consistency check” error message)
2. In firebird.log

Heavy and Easy corruptions

- Easy corruptions
 - Users data are corrupted (partially)
 - User's indices corrupted
- Heavy corruptions
 - System data are damaged (**We can't read users data!**)

STANDARD MEANS TO
RECOVER DATABASE

Standard way to recover

- Stop Firebird server.
- Make a copy of Firebird database.
- Start Firebird server and run the following commands:

```
gfix.exe -v -full
```

```
gfix.exe -mend -ig
```

```
gbak -b -g -v
```

- If backup completed successfully, restore database:

```
gbak -c -v -user SYSDBA -pass masterkey  
path_to_backup path_to_database
```


Tips

1. Try to run them all, even if gfix shows errors.
2. Always use switch `-ig` for gbak to ignore checksum errors
3. Always use switch `-g` for gbak to suppress garbage collection (and to workaround index errors)
4. Use `-v` switch to have detailed output

Restore errors

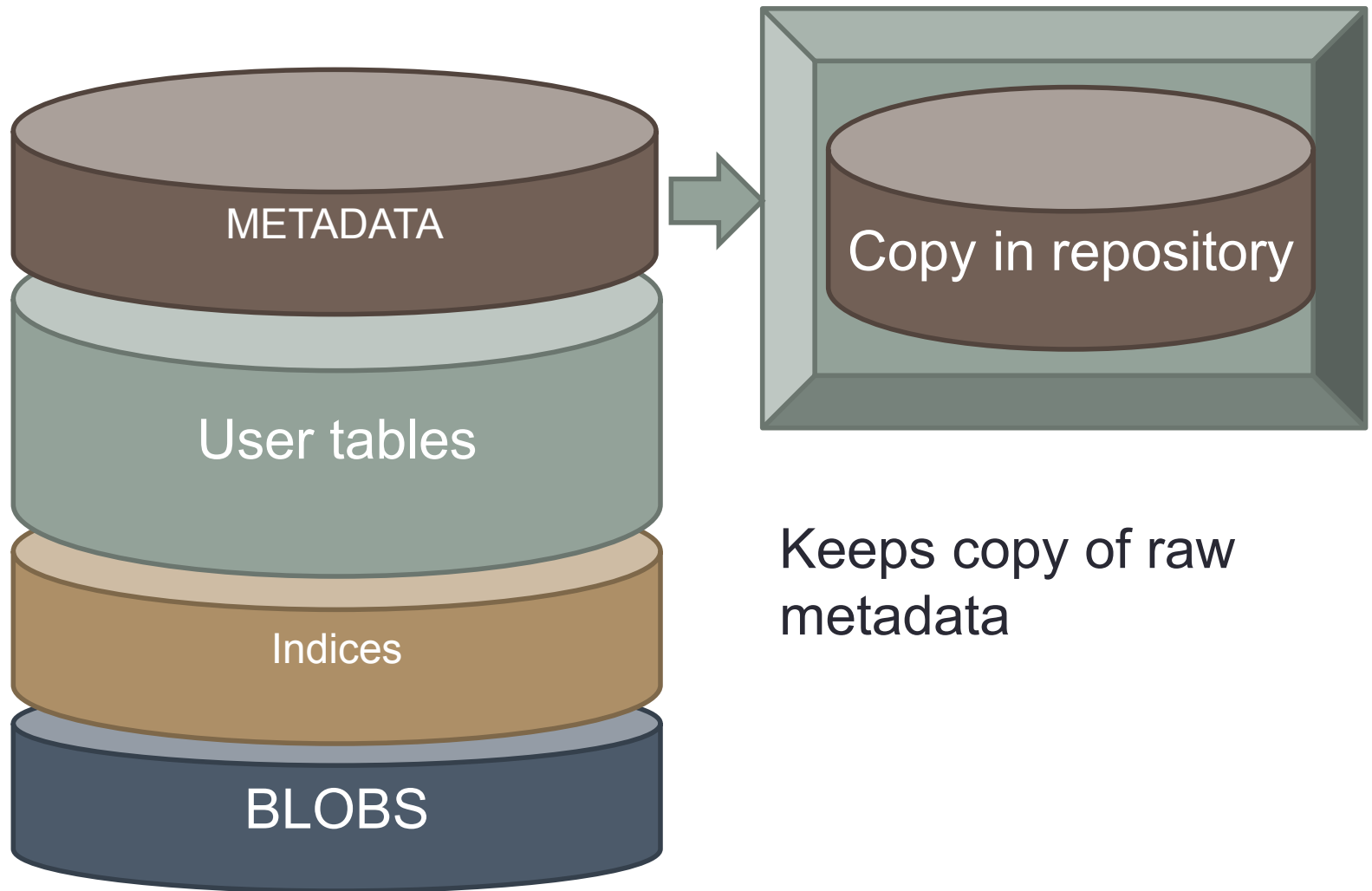
- After fixing corruptions it's a often to see "**Cannot commit index**" error at restore step.
 - In Firebird 2.0 and later this comes as a warning and database will be not brought on-line
- 1) IBDataPump (free tool)
<http://www.clevercomponents.com/demo/datapump/IBPump.zip>
- 2) Create only metadata database
- gbak -c -m
- 3) Run IBDataPump and set partially repaired database as Source, and fresh empty database as target

Effectiveness

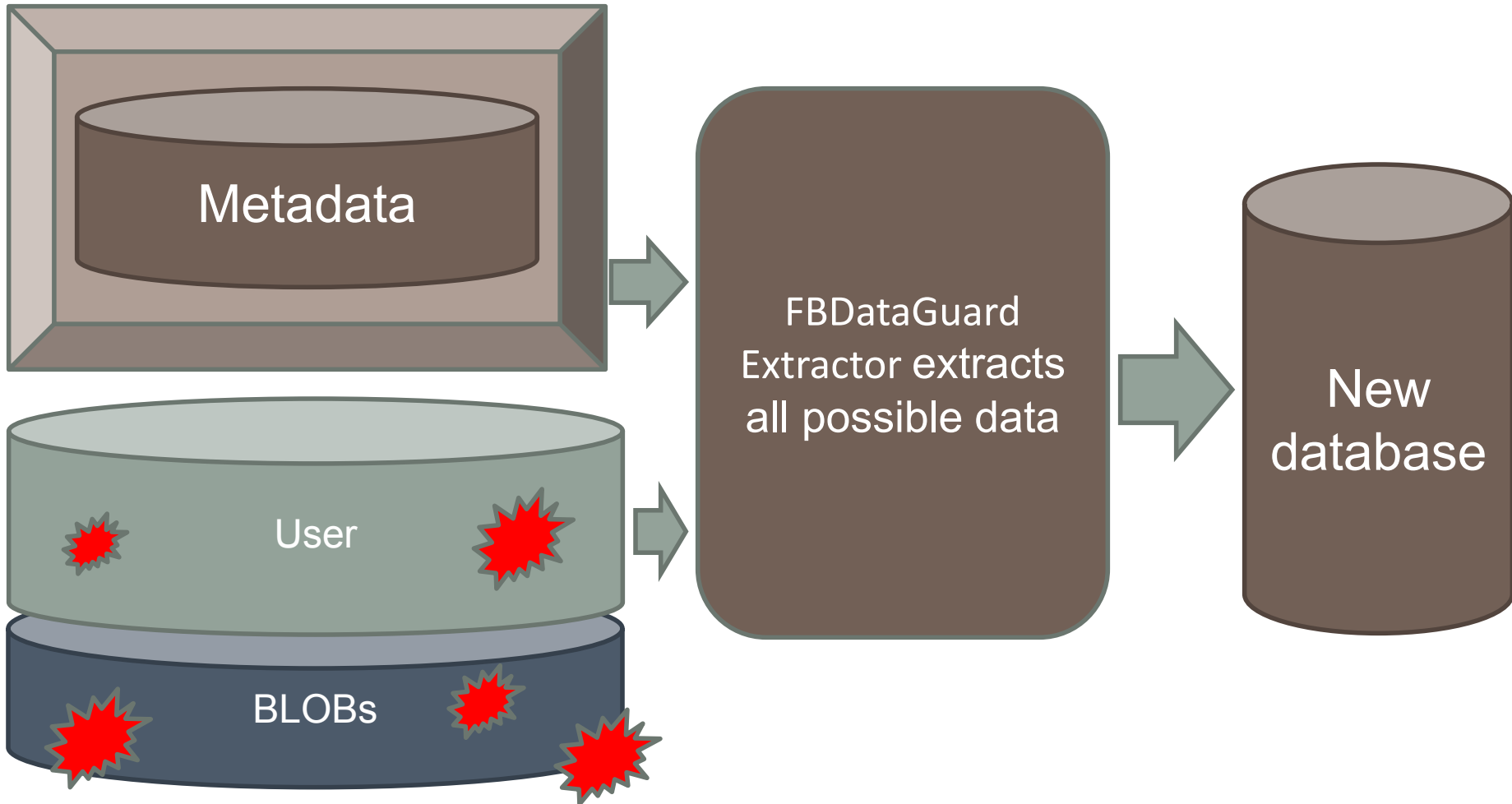
- Gbak+Gfix can recover almost all easy corruptions
- What they cannot do:
 - Heavy corruptions with a lot of losses
 - System data corruptions

IBSURGEON TOOLS

Metadata repository



HQBird FBDataGuard



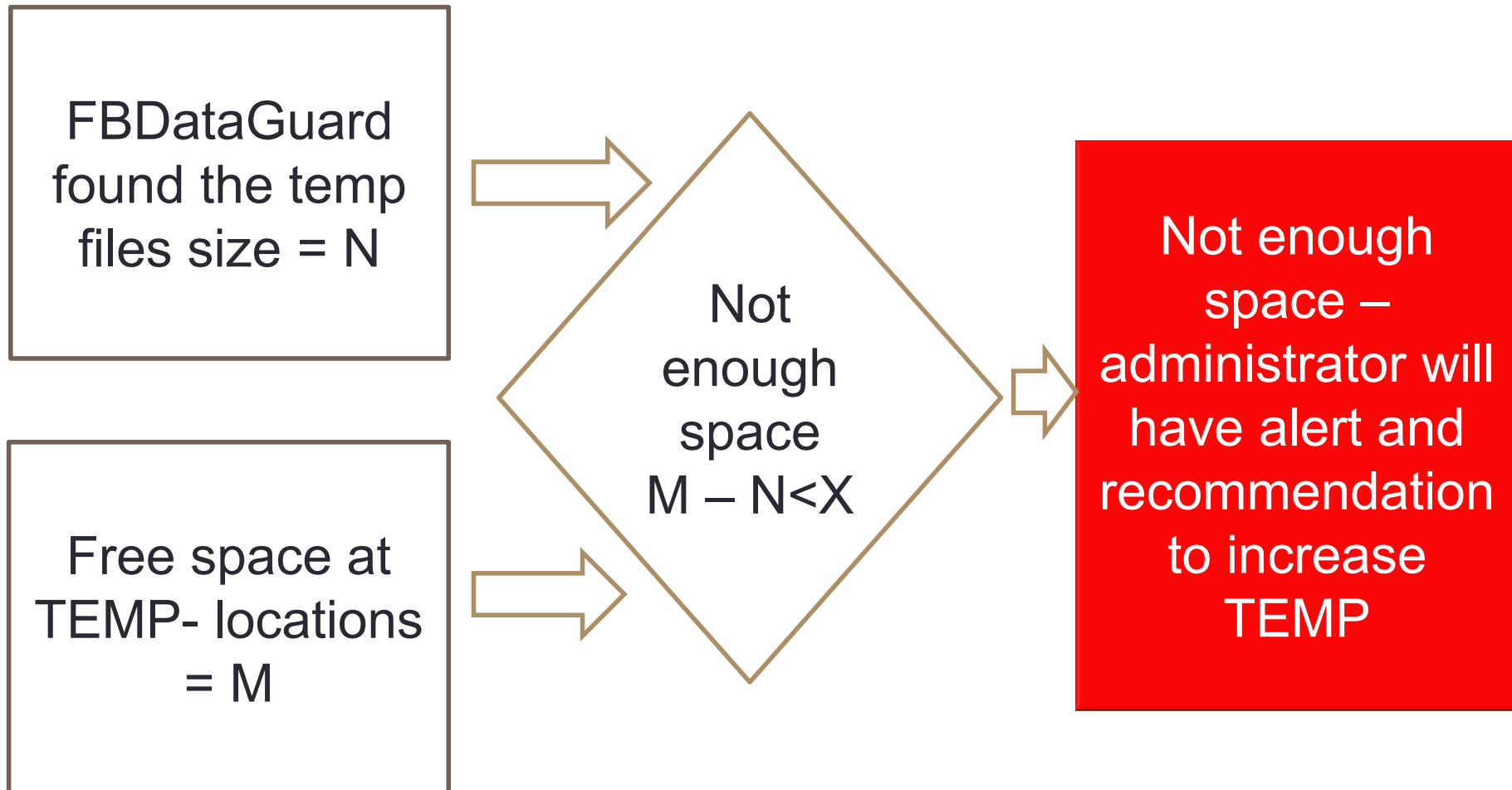
Demo

Up to 99% of successful recoveries!

And also

- HQbird FBDataGuard does monitoring and health checks
- Backups and maintenance schedule
- 26 parameters to check
- Email alerts
- Web-console

Example with TEMP



Example alert

Тема [exposites, ID=VJQ-K><BVSQ-UEBL]: [CRITICAL][Server 1/Check Temp Files]: Too big temporary files

10.09.2010

кому dgbride@ib-aid.com ☆

другие действия

Too big temporary files

Total size of all temporary files 3 Gb is more than recommended: 500 Mb

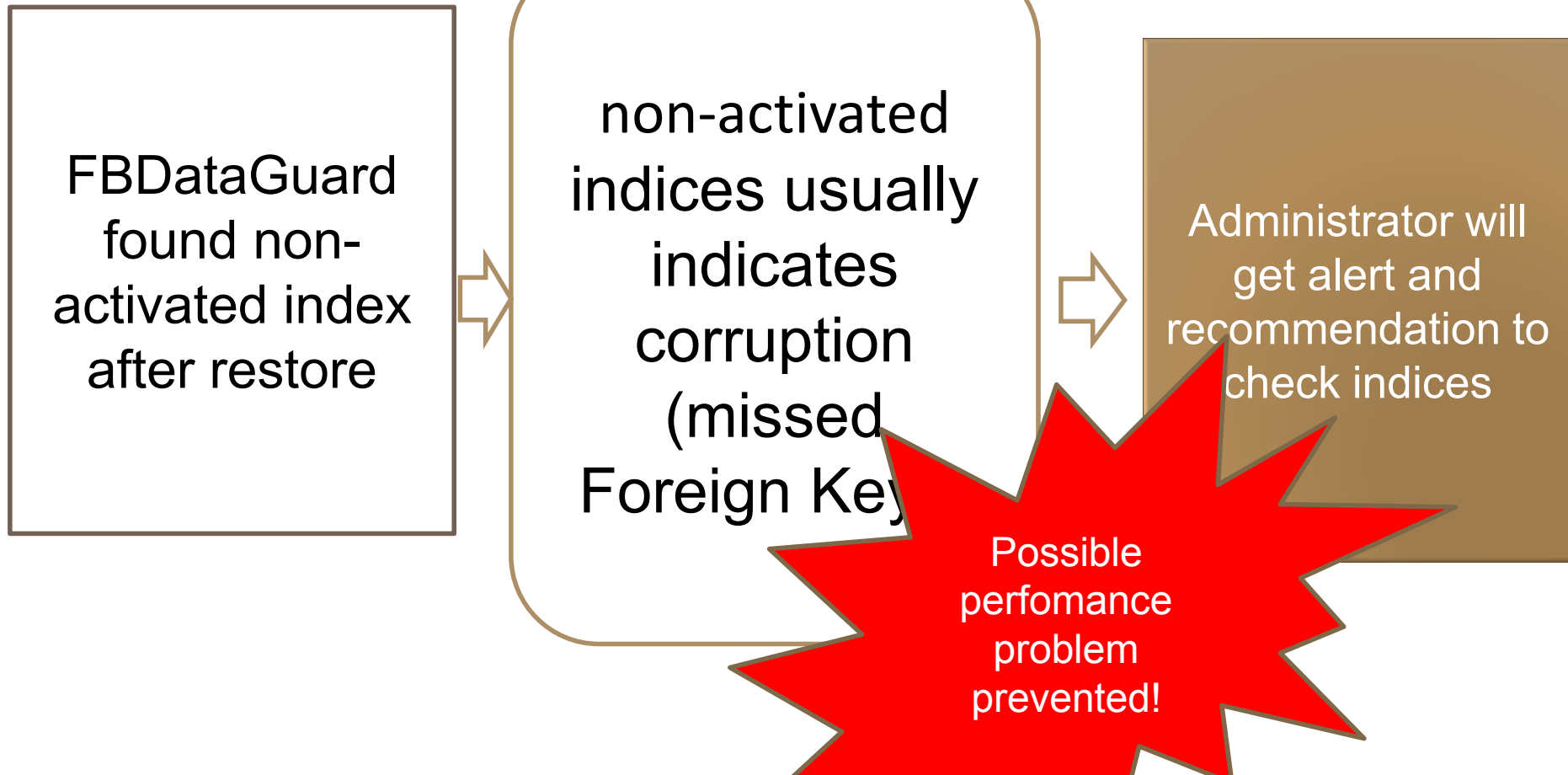
Firebird creates temporary files for some SQL queries (PLAN SORT). Too big size of temporary files can indicate performance problems. This is not a strictly defined number, so this threshold depends on particular database and application.

Too big temporary files

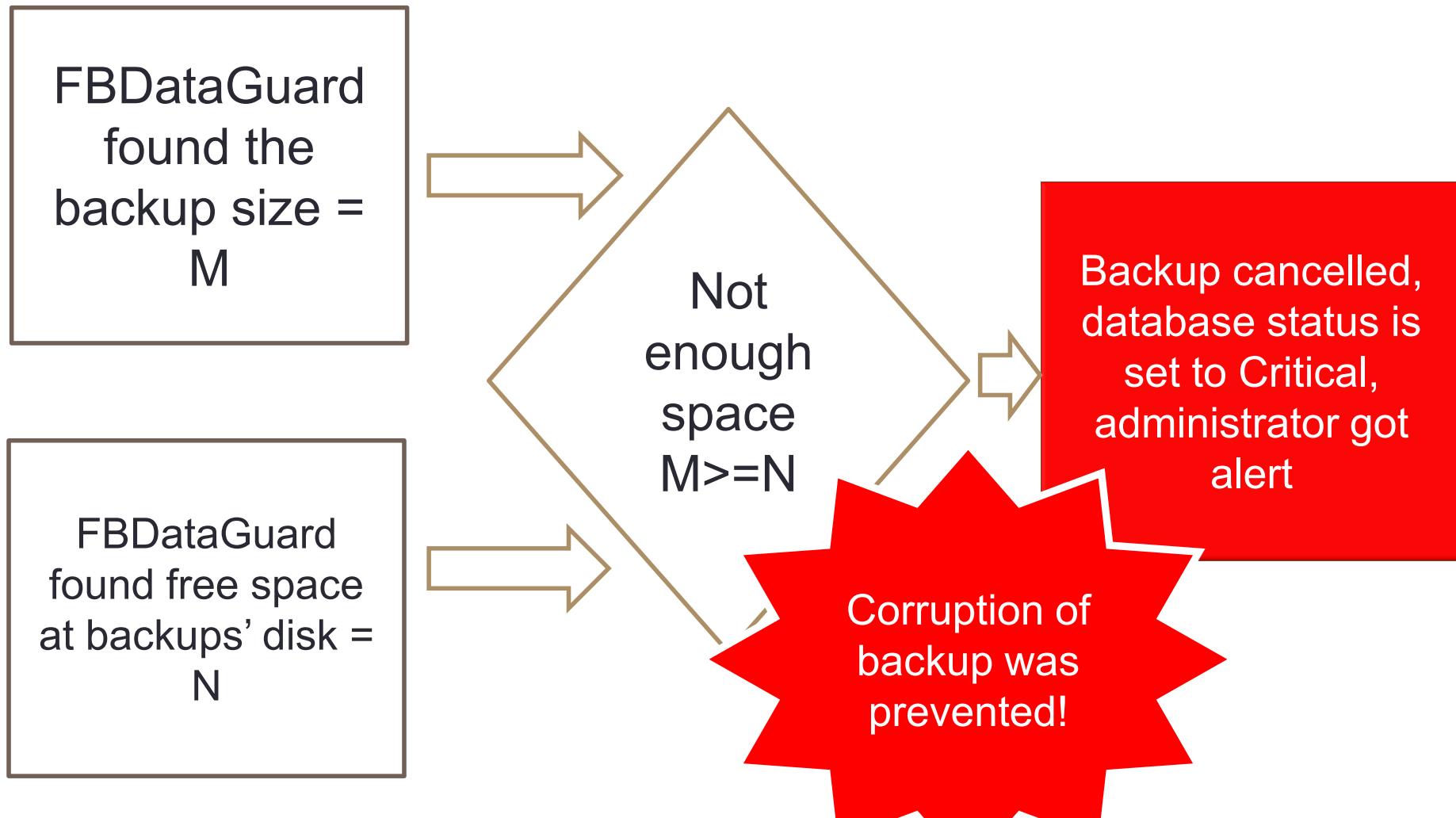
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Index problem example



Example of backup problem resolution



Example of backup problem alert

TEMA DataGuard [MALFUNCTION]: Job backup@[server-0000 / db-0000] malfunction (backup@[server-0000 / db-0000])

27.08.2010 2:48

кому watcher1@ib-aid.com ☆

другие действия ▾

```
Job backup@[ server-0000 / db-0000 ] malfunction
```

```
Unexpected job backup@[ server-0000 / db-0000 ] error: There is not enough space on the disk
```

```
It is something, we're not ready to, so the only advice is to bid a bead and roll up the sleeves. And don't forget your favorite tambourine!
```

- Job backup@[server-0000 / db-0000] malfunction
- Unexpected job backup@[server-0000 / db-0000] error: There is not enough space on the disk

Example of good backup notification

тема [exposites, ID=VJQ-K> <BVSQ-UEBL]: [OK]/[Server 1/GCMS/Do Backup]: Regular backup was done successfully

28.08.2010 10:18

кому dgbride@ib-aid.com ☆

другие действия ▾

Regular backup was done successfully

Backup [C:\DataGuard\058dc604-c3b7-41b8-94cb-c637f8296393\backup\gcms_20100827_23-00.zbk] 1000 Mb was created at 11:00:00 PM took 04m:12s.047 to complete.

Backup:

[OK] Backup [C:\DataGuard\058dc604-c3b7-41b8-94cb-c637f8296393\backup\gcms_20100827_23-00.fbk] 1000 Mb done successfully at 11:04:12 PM, taking 04m:12s.047.

Restore:

[OK] Restore [C:\DataGuard\058dc604-c3b7-41b8-94cb-c637f8296393\backup\restore.fdb.tmp] 1263 Mb done successfully at 11:16:30 PM, taking 12m:17s.796.

Other:

[OK] Archive [C:\DataGuard\058dc604-c3b7-41b8-94cb-c637f8296393\backup\gcms_20100827_23-00.zbk] 165 Mb done successfully at 11:18:02 PM, taking 01m:32s.469.

Hardware and UNDELETE failures

- HDD corruption
- Flash-drive corruption
- UNDELETE problem

Summary

- Better prevent corruption than fix it:
 - Use HQbird FBDataGuard to monitor and protect
 - Use failover solutions
- In case of corruption
 - Run standard tools gbak+gfix
 - Use IBSurgeon FirstAID

Questions? ak@ib-aid.com