



# Firebird big databases

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IBSurgeon



# Agenda

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- What is a big Firebird database?
  - 1 Terabyte (1024Gb) database test
  - Real-world examples
  - Our statistics for databases sizes growth
- Specific of the big databases maintenance
  - Backup/restore approach
  - Health checks for indices and data
- Automated maintenance





# WHAT IS A BIG FIREBIRD DATABASE?



# What is a big Firebird database?

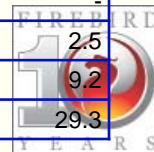


## *Pre-history*

- 2005
  - IBSurgeon found 37 gigabytes per table limit in Firebird 1.0-1.5 and all InterBase version
- 2006
  - Firebird 2.0 fixes that limit, and introduces nbackup
  - IBSurgeon and AVARDA (ERP) shows working with the 100gb database
- 2009 – IBSurgeon created 1 TB Firebird database

<http://www.ib-aid.com/articles/item104>

Table name	Record counts	Size, gb	Execution time of select count(*)	Index creation time	Tmp file size, Gb	Index size, Gb
WAREHOUSE	1240	0.002	0s	0	0	0.0
ITEM	100000	0.012	0.7s	-	-	0.0
DISTRICT	124000	0.017	0.7s	6	-	0.0
NEW_ORDER	111600000	32	20m 00s	23m 00s	4.56	0.8
CUSTOMER	372000000	224	-	41m 00s	-	2.6
customer_last				1h 52m 32s	12.4	2.3
fk_cust_ware				2h 10m 51s	-	2.3
HISTORY	372000000	32	-	-	-	-
ORDERS	372000000	25	32m 00s	45m 41s	15.2	2.5
STOCK	1240000000	404	-	3h 34m 44s	41.5	9.2
ORDER_LINE	3720051796	359	-	12h 6m 18s	182.0	29.3



# What is a big Firebird database?



## *Examples*

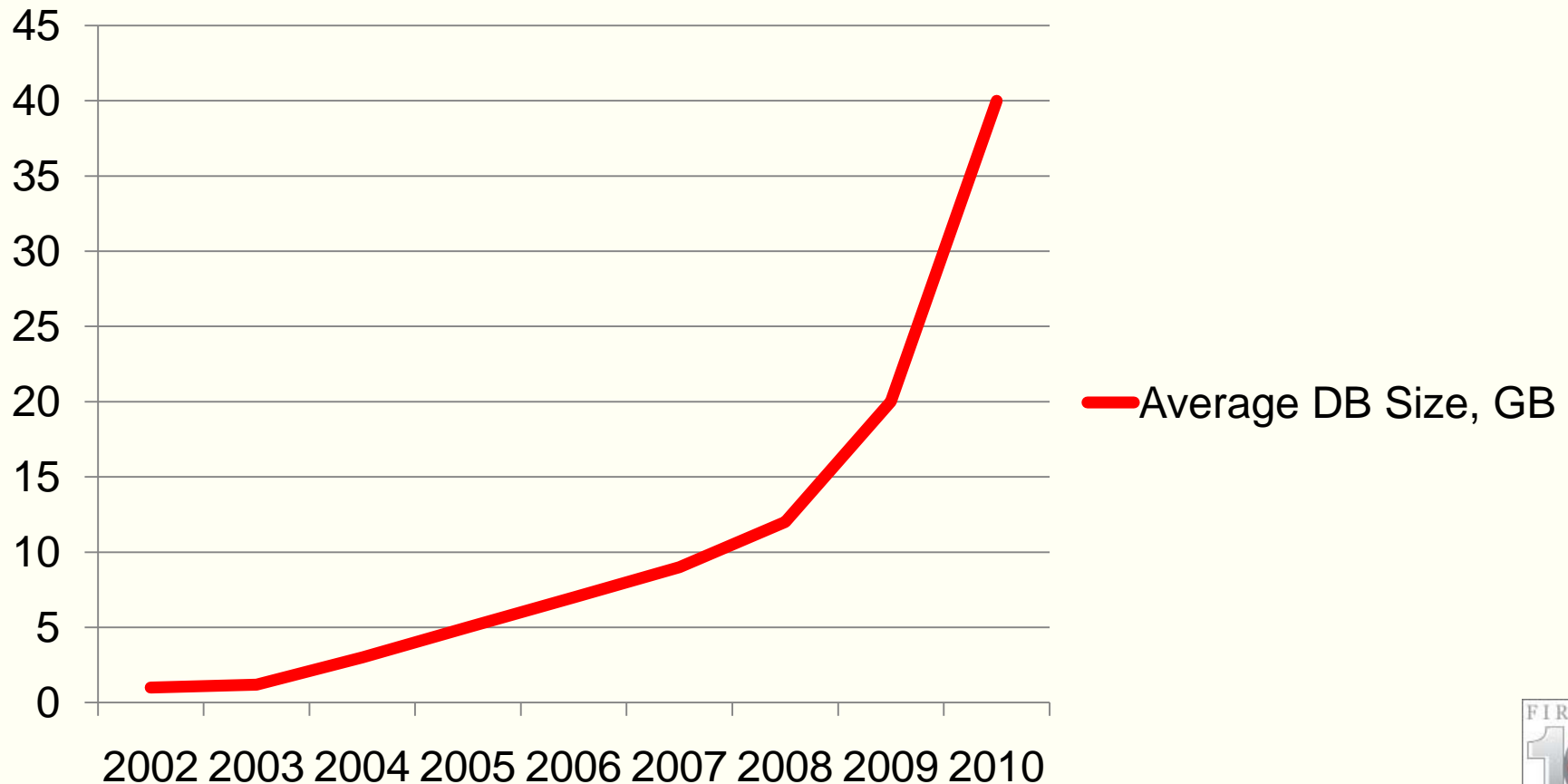
- **BAS-X**, Australia, warehouse & ERP
  - 200-450 GB, no BLOBs
- **Watermark**, UK, scanned documents and full-text search
  - 300+ GBs, BLOBs
- **Profitmed**, Russia, medical distribution company
  - 50 GB, **no BLOBs**
- **Avarda**, Russia, ERP
  - 100Gb, no BLOBs
- **Megafon**, Russian cell operator (№3)
  - 50 GB, cell information storage, no BLOBs



# Sizes of Firebird databases (IBSurgeon's customers statistics)



Average DB Size, GB



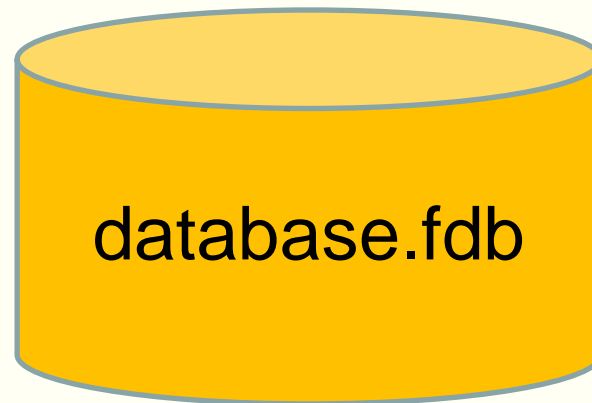


# **SPECIFIC OF BIG DATABASES MAINTENANCE**





**Usually Firebird database looks simply as**



**because it is believed as something simple.**





# Zero maintenance?



- Self-tuned in 90% cases
  - Default firebird.conf is good enough
  - Default database parameters: sweep, buffers, etc are good enough
  - Page size 4096 is Ok
- Maintenance is simple
  - Just make backup/restore

Not true for big databases.



# Big databases are hard to maintain

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- Backup/restore cycle can take hours
  - Depends on data density and HDD performance – numeric data are restored slowly
  - Bad example - 1 hour to restore 3.6 GB database
  - Good example – 12 hours to backup 450 Gb database
- Sweep takes from 30 minutes to 4 hours
  - For 50Gb database
- gfix of the 37 GB database takes 1-2 hours
- Restore of 50 GB database takes 4 hours



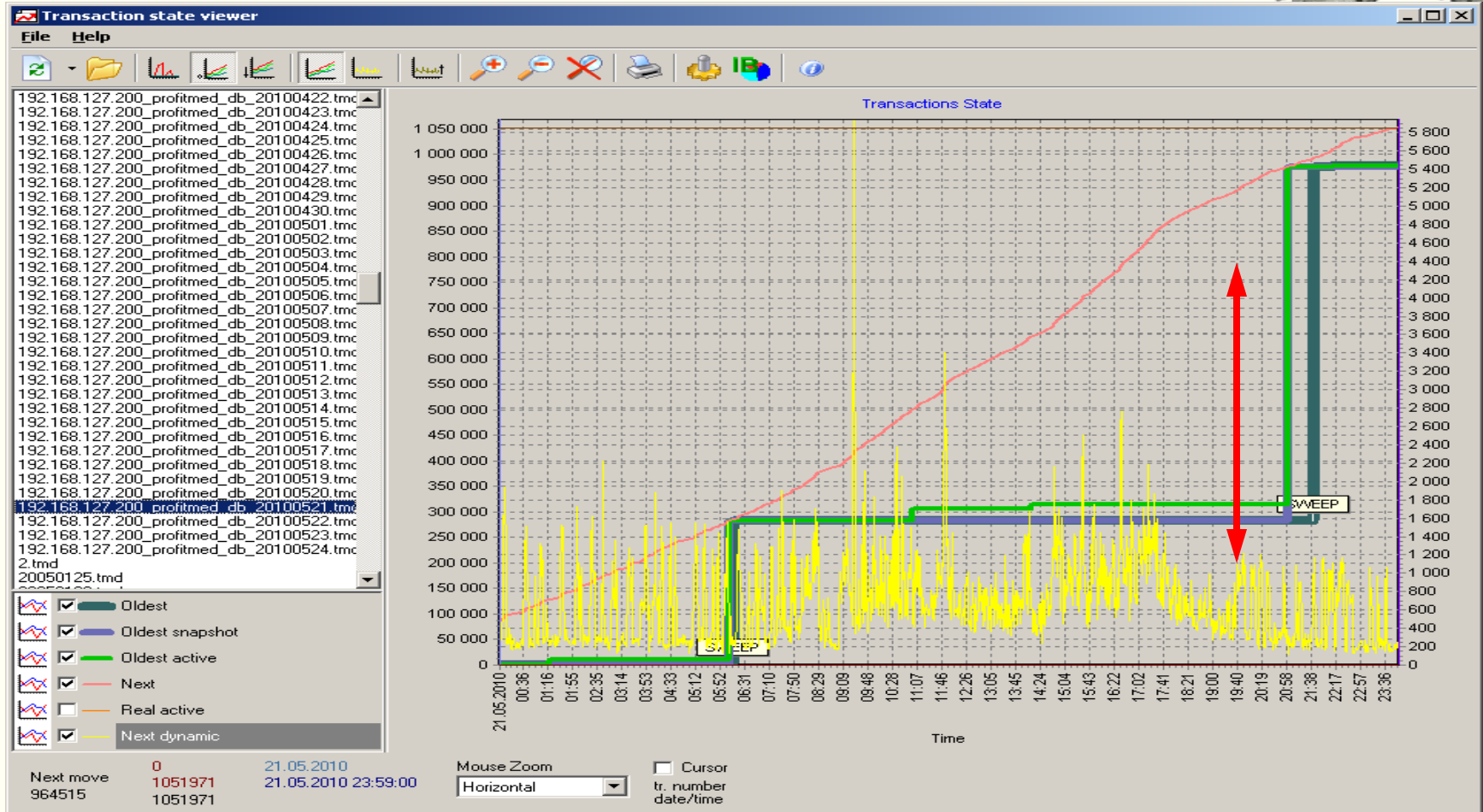
# Big database have high business requirements



- Profitmed
  - ~450 concurrent users
  - 50 gigabyte database with very intensive load, +1Gb/month
  - 12 hours x 7 days work mode
- high availability requirements
  - "warn us at least 5 minutes before crush"
  - 1 day stop costs ~\$50000 (min)
- Firebird 1.5 Classic 64 bit
- 64-bit CentOS Linux, 64Gb RAM, SCSI
- Single-user backup takes 30 minutes
- Multi-user backup takes 2 hours
- Restore takes 4 hours
- nbackup is not available in Firebird 1.5, plain copy is used (with shutdown)
- Sweep
  - only manual
  - from 30 minutes to 1 hour
  - 2 times per day



# no\_garbage\_collect



Legacy applications doesn't care about transaction control,  
so, at some moment connection can garbage collect lot of versions





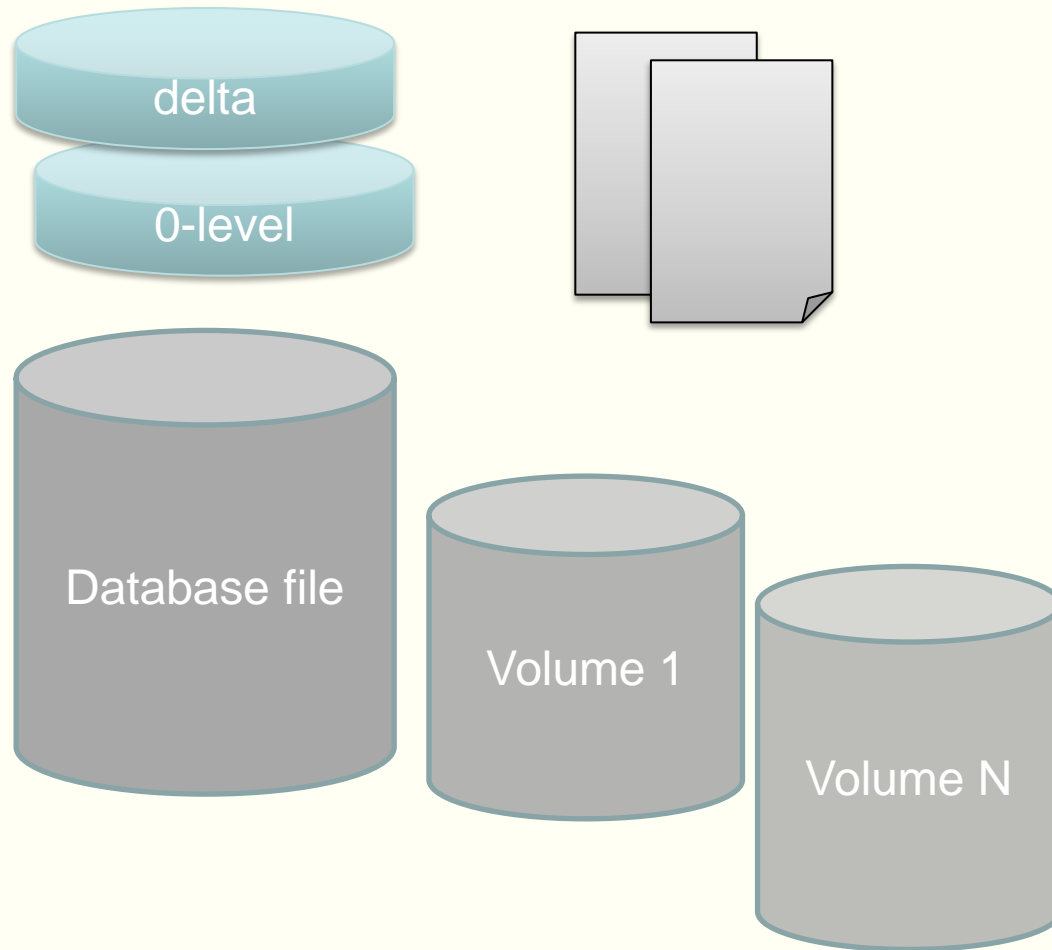
**How to deal with such big  
database and fulfill heavy  
business requirements?**

***We need to look into details of  
Firebird database***





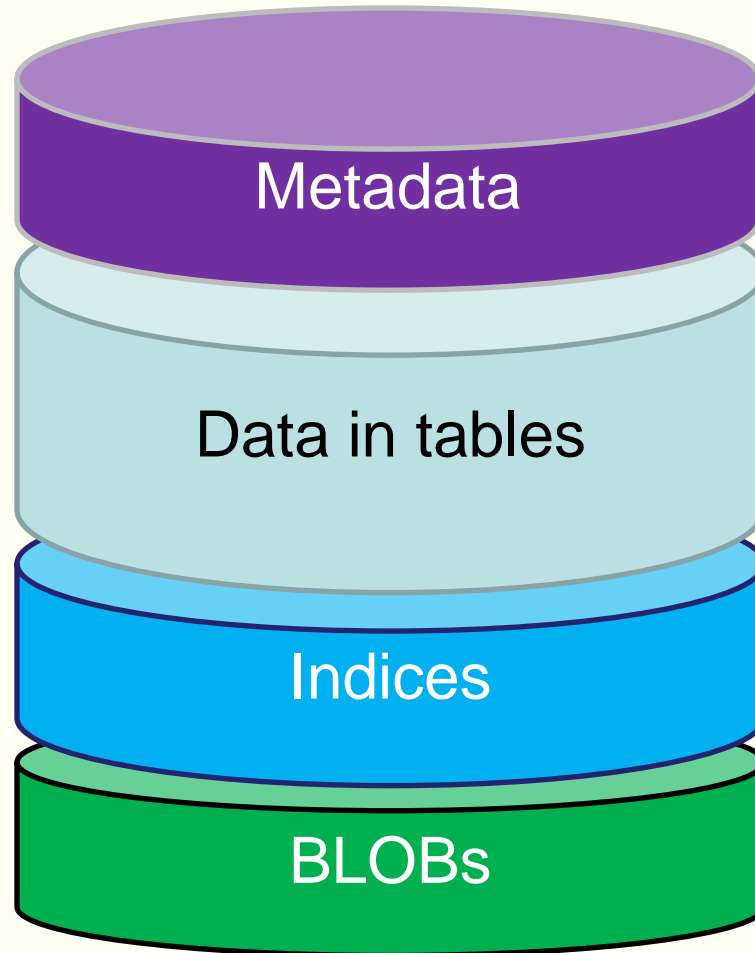
# *Files structure*



- Main database file
- Volume files
- delta (nbackup) and incremental backups
- External tables



# *Internal structure*



# Key difference between small and big databases

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- **Small database – backup/restore and relax**
  - Just make backup/restore – it creates database from scratch and removes all problems
  - Transaction issues and other problems does have time to grow between backup/restore cycles
- **Big database – need to check and maintain in several steps...**





# Big database requires individual maintenance plan

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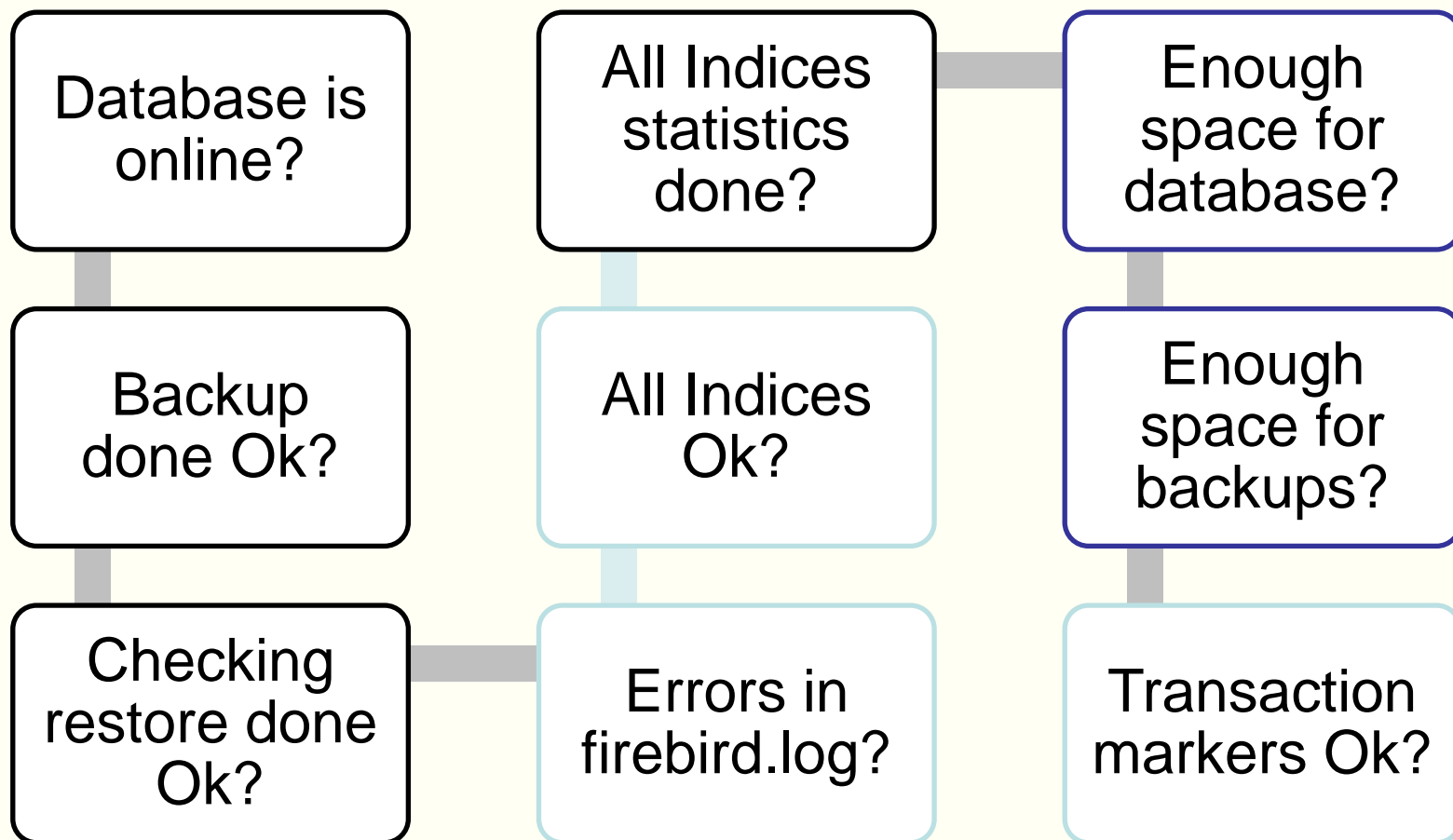


- Maintenance plan depends on size of database and work mode (8x5, 24x7)
- Backups scheme is not simple
- Perform test restore at separate server
- To be checked
  - Errors – in firebird.log and run error checking queries on live database
  - Metadata – check integrity
  - Metadata limits
  - Data & BLOBs – walk through data, check segmentation
  - Indices – check indices health
  - Transactions – any gaps, garbage growth, other problems



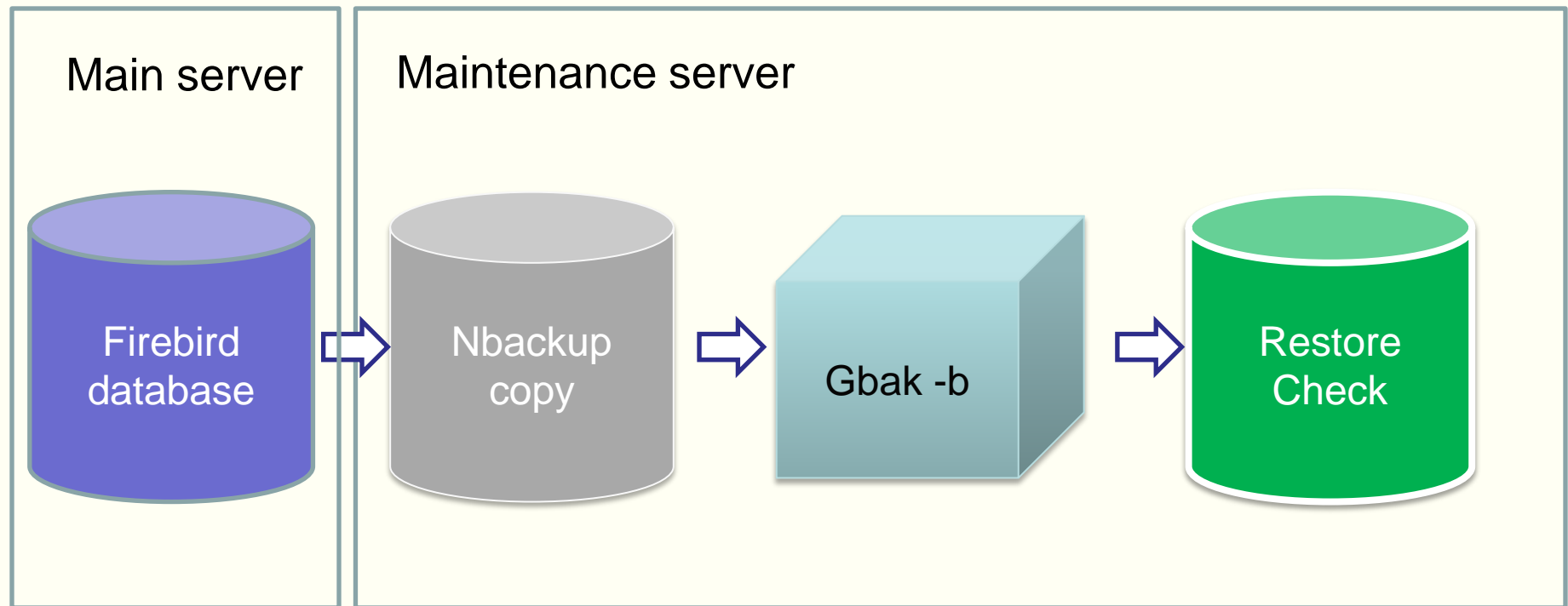


## Everyday minimal (!) maintenance plan for big database





# Example of backup plan for big Firebird database



**And each step should be confirmed and reported.**



# What to monitor-1

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- Server and database errors
  - Server and database availability
  - Check all changes in firebird.log
  - Check metadata
- Transactions
  - Transaction markers monitoring (garbage problems)
  - Limit (2 billions between backup/restore)
- Users
  - Min/max/avg users



# What to monitor-2

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- Database files
  - Single volume and multi-volume
  - Paths – where to stored (not at the same drive with temp files and backups!)
  - Sizes and growth limits
- Delta-files (nbackup)
  - Life-time and sizes
- Backup files
  - Existence, sizes and growth limits



# What to monitor-3

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- Temp files Firebird
  - Overall size and quantity
- Number of formats per table
  - No more than 255
  - Less formats in production
- Non-activated and deactivated indices
  - Deactivated – explicitly deactivated (why deactivated?)
  - Non-activated – indicates problems during restore



# What to monitor-4

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- Periodical statistics (gstat)
- Firebird server version
  - Latest patches are recommended
- Firebird installation size
- Firebird logs size and paths





- Backups
  - Revolver (days, week, month copies) backups
  - Backup depth
  - Checking restore (need to check results)
  - Growth prognosis (if not enough space, backup should be canceled)
  - Control backup time (too long backup indicates problems)







- Indices
  - Recalculate indices statistics
    - Selected or excluded
  - Check index status – active/in-active/non-activated
  - Check physical index health





- Validate database with gfix
  - Don't forget to shutdown database
  - Analysis (including firebird.log)
- Metadata validation
  - Check important system tables
- Firebird.log maintenance
  - When log becomes very big, copy it to backup log files
- And some more things....



**Your  
administrator  
definitely does  
all these steps...**





**...especially at remote offices.**



# And this is not enough!

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- Business wants to have warranty - even if hardware fails data should be recovered!





# THAT'S WHY WE CREATED FBDATAGUARD



# FBDataGuard does all above things...

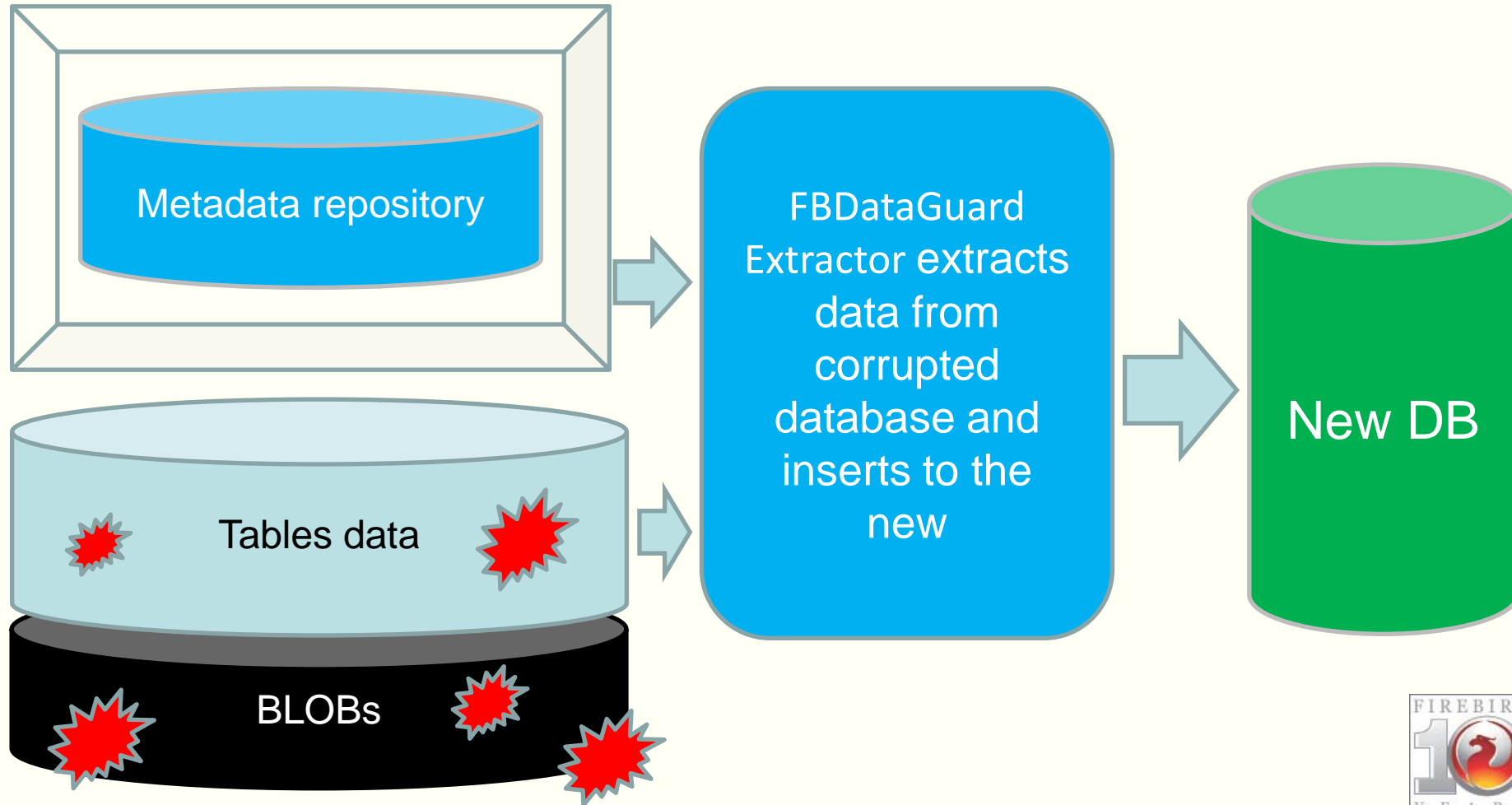
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- Watches database files, volumes, deltas, performs and checks backups in the right way
- Verifies metadata, data and indices
- Watches for errors, limits and wrong versions
- Sends alerts and recommendations



# And even more – protects from hardware failures







- Watch for 26 important database and server parameters
- Alerts for potential and real problem by email
- Proper automation of database maintenance
- Windows, Linux, MacOS, Firebird 1.5-2.1
- Special licensing for ISV (Independent Software Vendors) Firebird developers





# IBSURGEON LICENSING CHANGES



# Why to change?

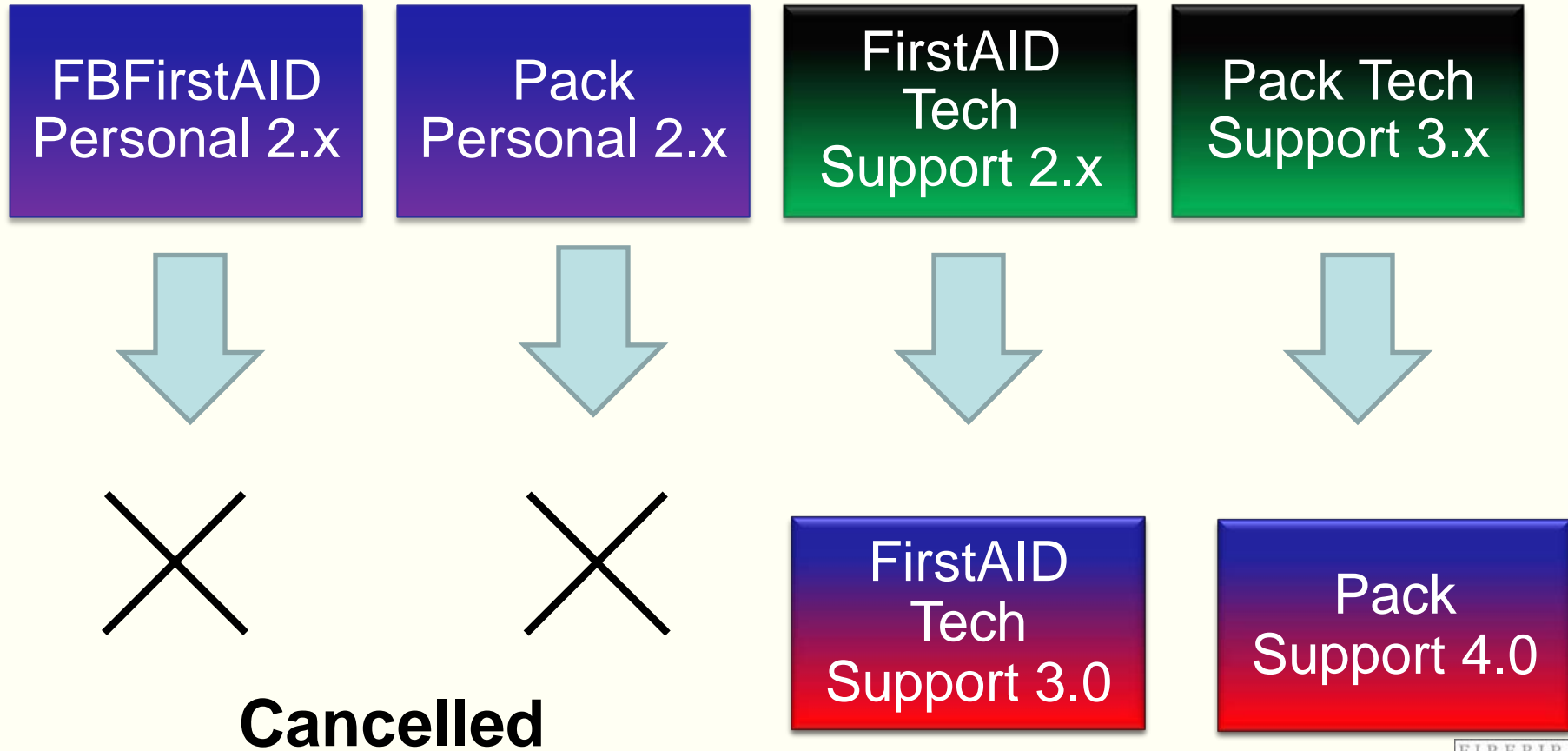
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- Prevent corruptions instead of fixing
  - It's time to fight reasons, not consequences
- Wrong license understanding
  - No more Personal
  - Software-As-A-Service
  - Cheaper recovery per database



# Upgrade paths





Upgrade from any Personal  
(FirstAID, Analyst, etc) to  
Pack Tech Support

- R\$300 (-50%)

New Pack Tech Support

- R\$800 (-50%)

1 server license of  
FBDataGuard

- Free!



# Questions?

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- [dataguard@ib-aid.com](mailto:dataguard@ib-aid.com)
- [www.ib-aid.com](http://www.ib-aid.com)

