Firebird 2.0

All about backups and new shutdown modes

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Shutdown – What's it?

- **What is it?**

  Allows to limit the number of connections to one database.

  Obs: A shutdown is specific to a database (not the whole server) so, you can have in the same Firebird Server, one or more shutdown databases, and other online databases.

Shutdown – How to?

- **How to put a database in shutdown state?**
  - Using **gfix** with the **–shut** parameter
  - To “full activate” the database, we use **gfix** with the **–online** parameter.

Shutdown and Firebird 1.5

- **Major "problem" with shutdown in Firebird 1.5:**

  The SYSDBA or DB Owner always can connect to DBs, including the ones in shutdown state.

- **Problem:**
  Impossible to guarantee "exclusive" connection to the database!

Shutdown in Firebird 2.0

- **Firebird 2.0 = new *shutdown modes*!**
  (thanks to Nickolay Samofatov)
- **Modes:**
  - **Normal**: DB is active/online.
  - **Single**: just one SYSDBA connection is accepted.
  - **Multi**: Compatibility with FB 1.5 shutdown mode.
  - **Full**: DB totally off-line. No connections accepted.

Scale: [more online...............less online]
normal ↔ multi ↔ single ↔ full

Shutdown in Firebird 2.0 (full mode)

- **FULL MODE (totally off-line):**
  - **No connections accepted**
  - **Interesting to make physical copies of the database file with no risk to get a corrupted DB.**
  - **Use third party tools (zip, rar, ace, etc.) to generate compressed copies of the database.**

Additional parameters for gfix and shutdown

- **-force <n>**
  Wait for “n” seconds before putting DB in shutdown mode.
- **-tran <n>**
  Avoid new transactions to be opened and waits “n” seconds for the currently transactions to be ended. If at the end of time there are still transactions opened, the shutdown is **canceled**.
- **-attach <n>**
  Avoid new connections to the DB and waits “n” seconds for the currently connections to be closed. If at the end of that time there are still connections active, the shutdown is **canceled**.

Command line examples

- Putting a DB in **full** shutdown mode:

```
gfix -shut full -force 0 database.fdb
```

- Changing from **full** to **multi** mode:

```
gfix -online single database.fdb
```

- Changing from **multi** to **single** mode:

```
gfix -shut single database.fdb
```

- Bringing DB back to “life” :

```
gfix -online database.fdb
```

Backups in Firebird

- ***No need for exclusive connections*** *– backups can be done with many active connections.*
- Default tool for backup/restore: **gbak**
- New tool for **incremental** backups: **nbackup**
  (thanks to Nickolay Samofatov)

Backup methods

- **Diferent ways of doing a backup:**
  - **gBak**
  - **Services API**
  - **nBackup (introduced in FB 2.0)**
  - **Physical copy of the database file (.fdb)**

gbak

- Gbak – features:
  - Backup files are **smaller** than DB file (doesn’t include index and “garbage”).
  - Possibility to do a **Garbage Collection** during the backup.
  - Backup file has **no garbage**, ie: back-versions, deleted records, etc...
  - Backup file represents the **full** database (all metadata structure and currently data).
  - Backup file can be created in local drives in the **terminal** machines in the network.
  - During a restore, you can **change page size** of DB.
  - During restore, you can **change DB owner**.

Gbak – features... (cotinued)

- Can split backup in multiple files, with their sizes *defined in Kbytes, Megabytes or Gigabytes*.
- During a restore, can create a database divided in multiple files, with their sizes defined in *number of database pages*.

Gbak – Usage examples

```
gbak -user SYSDBA -pas masterkey 192.168.1.10:c:\data\database.fdb c:\backups\backup.gbk
```

```
gbak -user SYSDBA -pas masterkey -SE 192.168.1.10:service_mgr c:\data\database.fdb c:\backups\backup.gbk
```

```
gbak -user SYSDBA -pas masterkey -r -p 4096 c:\backups\backup.gbk 192.168.1.10:c:\data\database.fdb
```

```
gbak [-b] [options] database.fdb file1 size1[k|m|g] file2 size2[k|m|g] file3
```

```
gbak [-r,-c] -[options] file1.gbk file2.gbk file3.gbk database_a.fdb 100000 database_b.fdb 100000 database_c.fdb
```

(*) Number of database pages

Services API

- Backup is **created by the Firebird server.**
- FB server uses **internal version** of gbak.
- Database files can be created **only** in **local drives** of the server.
- Easy **integration** inside applications (friendly interface).
- Many components (for Delphi) includes specific components to do backup/restore: IBOAdmin, FIBPlus, etc.

Backup code example (using IBOAdmin)

```
with Backup do
 begin
   Active := True; // Properties must be configured before this…
   try
     Log('Doing backup...');
     try
       ServiceStart;
       while not Eof do
       begin
         x := GetNextLine;
       end;
       while IsServiceRunning do
       begin
         Application.ProcessMessages;
         Screen.Cursor := crHourGlass;
       end;
     except
       ShowMessage('Problem during backup creation!');
       raise;
     end;
   finally
     active := false;
   end;
 end;
```

nBackup

- **New in Firebird 2.0!**
- Allows to create **incremental backups.**
- Backup files are **physical copies of database pages.**
- Backups **stores everything**, including index pages and possible garbage (back versions, etc).
- Can be **run only in the server machine.**
- Do **not need exclusive access to DB.**
- **Doesn’t work with multiple files databases.**

nBackup - Parameters

- **nBackup parameters:**

```
-L <database> Locks a database
-N <database> Unlock a previously locked database
-F <database> Alter DB header flag to “normal” mode
-B <level> <database> [<filename>] Creates a backup of
level <level>
-R <database> [<file0> [<file1>...]] Restores a backup
-U <user>  User doing the backup/restore
-P <password>  User password
```

- With **–L**, you can “**lock**” database file to do physical copies, generate compressed copies (zip, etc) **without blocking connections**.
- Use **-N** to “**unblock**” database.

Thinking about backup policies

- Can be created/scheduled using standard SO utilities, like **cron** (linux) or **scheduler** (windows).
- Example:
  1. Beginning of every month, a **level 0** (complete) backup is created
  2. Every Monday, a **level 1** backup is created
  3. Every day, a **level 2** backup is created
  4. Every hour, a **level 3** backup is created

- *This examples would allow to recover a database in any "hour" interval, as far all the needed backup files are available.*

Nbackup examples

Creating a **level 0** backup:

```
nbackup -B 0 \FB\database.fdb
```

generated file (auto-named):

```
database.fdb-0-20060331-1535.nbk
             |     |      |→ Hour (hour/minute)
             |     +--------------→ Date (year/month/day)
             +-----------------------------→ backup level
```

Restoring backups with nbackup:

```
nbackup -R \FB\database.fdb  database.fdb-0-20060331-
   1535.nbk  database.fdb-1-20060331-1551.nbk
```

Physical file copy

- Advantges:
  - The backup is the database file itself (easy and fast to put it online)
  - The **speed** is direct related to the hardware used (HDs, network cards, CPU, Tape drives, etc).
- To **avoid corrupted backups**, the database file must be blocked (with **nbackup –L**) or put in **FULL shutdown mode**.

Third party tools (1/3)

- **FIBS (Firebird InterBase Backup Scheduler)**
  - **Free**
  - **Run in Windows, uses gBak to do the backups**
  - **Can compress automaticly the generated backup file**
  - **Can send automated emails**
  - **Multitask**
  - **Allows backup scheduling**
  - **Can send backup files to ftp sites**

- **dBak**
  - **Free**
  - **Doesn't use gbak or the service API**
  - **Run on windows**
  - **Backup is generated as a database file**
  - **Has a VCL version**

Third party tools(2/3)

- **Time to Backup**
  - **Run on Windows (>= NT) and Linux**
  - **Can compress the generated backup file**
  - **Can send emails**
  - **Multitask**
  - **Allows scheduling**
  - **Uses Services API**

- **Firebird InterBase Backup Manager (FIBackup)**
  - **Free and Open Source**
  - **Uses Services API**
  - **Run on Windows**
  - **Allows backup scheduling**
  - **Integration with FBHelm**

Third party tools (3/3)

- **IBExpert Studio (*Backup Service*)**
  - **Includes a backup/restore service**
  - **Can zip the backup file**
  - **Can send email notifications**
  - **Runs as a Windows service**
  - **Uses the Service API**
  - **Allows scheduling of backups/restores**

The End

- **Any questions???**