

openGauss 开源数据库二次开发实验报告

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实验步骤：

- 社区环境准备
- 搭建环境开发
- 二次开发（以实现 gauss_hello 函数为例）
- 编译
- 验证二次开发结果

实验报告

一、实验过程

- 1、社区环境准备：①注册码云账号；②绑定主邮箱；③签署 CLA 贡献者协议
- 2、搭建环境开发：①拉取个人分支；②安装并配置 Git 环境；③安装开发工具
- 3、二次开发

①将个人远程仓库内容更新至本地

```
F:\openGauss-server>git clone https://gitee.com/wangjiaomei/openGauss-server.git
Cloning into 'openGauss-server'...
remote: Enumerating objects: 54357, done.
remote: Counting objects: 100% (54357/54357), done.
remote: Compressing objects: 100% (16665/16665), done.
remote: Total 54357 (delta 37137), reused 54357 (delta 37137), pack-reused 0
Receiving objects: 100% (54357/54357), 195.03 MiB | 2.53 MiB/s, done.
Resolving deltas: 100% (37137/37137), done.
Updating files: 100% (12507/12507), done.
```

②修改本地文件

③提交本地修改到个人远程仓库

```
F:\openGauss-server\openGauss-server>git push origin master
Enumerating objects: 29, done.
Counting objects: 100% (29/29), done.
Delta compression using up to 8 threads
Compressing objects: 100% (15/15), done.
Writing objects: 100% (15/15), 1.41 KiB | 1.41 MiB/s, done.
Total 15 (delta 14), reused 0 (delta 0), pack-reused 0
remote: Powered by GITEE.COM [GNK-6.3]
To https://gitee.com/wangjiaomei/openGauss-server.git
3e14e85f..1e94e76f master -> master
```

4、编译

①准备编译环境

②版本编译

在 Linux 环境下安装软件依赖包、安装 Git 工具并配置 Git 环境

下载 openGauss-server 和 openGauss-OM 代码

```
[root@ecs-7f28 soft]# git clone https://gitee.com/wangjiaomei/openGauss-server.git opeGauss-server
Cloning into 'opeGauss-server'...
remote: Enumerating objects: 54372, done.
remote: Counting objects: 100% (54372/54372), done.
remote: Compressing objects: 100% (16680/16680), done.
remote: Total 54372 (delta 37163), reused 54332 (delta 37137), pack-reused 0
Receiving objects: 100% (54372/54372), 194.82 MiB | 1.25 MiB/s, done.
Resolving deltas: 100% (37163/37163), done.
Updating files: 100% (12507/12507), done.
[root@ecs-7f28 soft]# git clone https://gitee.com/wangjiaomei/openGauss-OM.git openGauss-OM
Cloning into 'openGauss-OM'...
remote: Enumerating objects: 3363, done.
remote: Counting objects: 100% (3363/3363), done.
remote: Compressing objects: 100% (1218/1218), done.
remote: Total 3363 (delta 2129), reused 3363 (delta 2129), pack-reused 0
Receiving objects: 100% (3363/3363), 2.31 MiB | 882.00 KiB/s, done.
Resolving deltas: 100% (2129/2129), done.
```

获取已编译好的第三方二进制代码

```
[root@ecs-7f28 soft]# wget https://opengauss.obs.cn-south-1.myhuaweicloud.com/3.0.0/opengauss-third_party_binarylibs.tar.gz
--2022-05-11 23:10:13-- https://opengauss.obs.cn-south-1.myhuaweicloud.com/3.0.0/opengauss-third_party_binarylibs.tar.gz
Resolving opengauss.obs.cn-south-1.myhuaweicloud.com (opengauss.obs.cn-south-1.myhuaweicloud.com)... 121.37.63.33, 139.159.208.243, 139.159.208.67, ...
Connecting to opengauss.obs.cn-south-1.myhuaweicloud.com (opengauss.obs.cn-south-1.myhuaweicloud.com)|121.37.63.33|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 2630884924 (2.4G) [application/gzip]
Saving to: 'openGauss-third_party_binarylibs.tar.gz'

openGauss-third_party_binarylibs.tar.gz 100%[=====>] 2.45G 1.27MB/s in 32m 58s

2022-05-11 23:43:04 (1.27 MB/s) - 'openGauss-third_party_binarylibs.tar.gz' saved [2630884924/2630884924]
```

③软件安装编译

5、验证二次开发结果

①安装编译后的 openGauss 安装包

修改操作系统配置、规划数据库安装包目录、创建 XML 配置文件

```
CPUNO=`cat /proc/cpuinfo|grep processor|wc -l`
export GOMP_CPU_AFFINITY=0-[$CPUNO - 1]

#sysctl -w vm.min_free_kbytes=112640 &> /dev/null
sysctl -w vm.dirty_ratio=60 &> /dev/null
sysctl -w kernel.sched_autogroup_enabled=0 &> /dev/null

umask 0077
```

启动安装过程部署 openGauss

```
[root@ecs-7f28 openGauss]# ls
clusterconfig.xml  openGauss-3.0.0-openEuler-64bit.sha256  simpleInstall
lib               openGauss-3.0.0-openEuler-64bit-symbol.tar.gz  upgrade_sql.sha256
openGauss-3.0.0-openEuler-64bit-Libpq.tar.gz  openGauss-3.0.0-openEuler-64bit.tar.bz2  upgrade_sql.tar.gz
openGauss-3.0.0-openEuler-64bit-om.sha256    openGauss-3.0.0-openEuler-64bit-tools.tar.gz  version.cfg
openGauss-3.0.0-openEuler-64bit-om.tar.gz    script
```

②登录数据库验证结果

启动数据库服务、连接数据库

```
[omm@ecs-7f28 ~]$ gs_om -t start
Starting cluster.
=====
[SUCCESS] ecs-7f28:
[2022-05-12 00:33:35.437][413947][][gs_ctl]: gs_ctl started,datadir is /gaussdb/data/db1
[2022-05-12 00:33:35.440][413947][][gs_ctl]: another server might be running; Please use the restart command
=====
Successfully started.
[omm@ecs-7f28 ~]$ gs_om -t status
=====
cluster name      : dbCluster
cluster_state     : Normal
redistributing    : No
```

验证第 3 章中开发的 gauss_hello 函数是否新增成功

```
openGauss=# select gauss_hello('openGauss User');
           gauss_hello
-----
Hello, openGauss User
(1 row)
```

如图所示，gauss_hello 函数新增成功！

二、实验中遇到的问题及解决办法说明

在此次实验中，我遇到并解决了以下 4 个问题。

1、修改完 openGauss-server 文件夹后，要提交本地修改到个人远程仓库，输入 “git push origin master” 命令，无法同步，报错内容如下图所示。

```
F:\openGauss-server\openGauss-server>git push origin master
Enumerating objects: 29, done.
Counting objects: 100% (29/29), done.
Delta compression using up to 8 threads
Compressing objects: 100% (15/15), done.
Writing objects: 100% (15/15), 1.41 KiB | 1.41 MiB/s, done.
Total 15 (delta 14), reused 0 (delta 0), pack-reused 0
remote: Powered by GITEE.COM [GNK-6.3]
remote: error: GE007: Your push would publish a private email address.
remote: You can make your email public or disable this protection by visiting:
remote: https://gitee.com/profile/emails
remote: error: hook declined to update refs/heads/master
To https://gitee.com/wangjiaomei/openGauss-server.git
! [remote rejected] master -> master (hook declined)
error: failed to push some refs to 'https://gitee.com/wangjiaomei/openGauss-server.git'
```

原因：我在 gitee 中设定了“禁止命令行推送暴露个人邮箱”，所以这里没办法正常推送。进入 gitee，在设置中将下图选项中的“√”取消即可。

如果你希望命令行 Git 操作使用你的私人邮箱地址，你必须在 Git 中设置你的邮箱地址。

☒ 禁止命令行推送暴露个人邮箱

由于你启用了不公开邮箱地址，如果你推送使用私人邮箱作为你的提交邮箱地址，我们将阻止推送并警告你的提交记录会暴露你的私人邮箱

主邮箱设置

再次尝试提交本地修改到个人远程仓库，成功！

```
F:\openGauss-server\openGauss-server>git push origin master
Enumerating objects: 29, done.
Counting objects: 100% (29/29), done.
Delta compression using up to 8 threads
Compressing objects: 100% (15/15), done.
Writing objects: 100% (15/15), 1.41 KiB | 1.41 MiB/s, done.
Total 15 (delta 14), reused 0 (delta 0), pack-reused 0
remote: Powered by GITEE.COM [GNK-6.3]
To https://gitee.com/wangjiaomei/openGauss-server.git
3e14e85f..1e94e76f master -> master
```

2、在编译安装 openGauss-server 时，输入“sh build.sh -m release -3rd

/openGauss-lab/soft/binarylibs -pkg”命令，报错结果如下：

```
[root@ecs-b482 openGauss-server]# sh build.sh -m release -3rd /openGauss-lab/soft/binarylibs -pkg
ROOT_DIR : /openGauss-lab/soft/openGauss-server
[makegaussdb] 22-05-11 22:46:07: script dir : /openGauss-lab/soft/openGauss-server/build/script
[makegaussdb] 22-05-11 22:46:07: Work root dir : /openGauss-lab/soft/openGauss-server
configure -D_USE_NUMA -D_ARM_LSE with arm opengauss mode
[makegaussdb] 22-05-11 22:46:08: configure failed.
configure failed.
[makegaussdb] 22-05-11 22:46:08: script dir : /openGauss-lab/soft/openGauss-server/build/script
[makegaussdb] 22-05-11 22:46:08: Work root dir : /openGauss-lab/soft/openGauss-server
Start package opengauss.
./separate_debug_information.sh: line 19: lsb_release: command not found
mkdir: cannot create directory '/openGauss-lab/soft/openGauss-server/build/script/../../mppdb_temp_install/symbols': No such file or directory
mkdir: cannot create directory '/openGauss-lab/soft/openGauss-server/build/script/../../mppdb_temp_install/packages': No such file or directory
./separate_debug_information.sh: line 35: cd: /openGauss-lab/soft/openGauss-server/build/script/../../mppdb_temp_install/bin: No such file or directory
change dir to /openGauss-lab/soft/openGauss-server/build/script/../../mppdb_temp_install/bin failed.
mv: cannot stat 'symbols.tar.gz': No such file or directory
Begin package server
sed: can't read /openGauss-lab/soft/openGauss-server/mppdb_temp_install/temp/bin/cluster_guc.conf: No such file or directory
/openGauss-lab/soft/openGauss-server/mppdb_temp_install
make server(all) package success!
packaging libpq...
[makegaussdb] 22-05-11 22:46:08: tar -zcvf openGauss-3.0.0-openEuler-64bit-Libpq.tar.gz failed
tar -zcvf openGauss-3.0.0-openEuler-64bit-Libpq.tar.gz failed
```

原因：这是因为前面获取已编译好的用于 openGauss-server 代码的编译第三

方二进制代码是 1.1.0 版本的，而这里编译安装 openGauss-server 是 3rd，产

生错误。最简单的方式是删除前面 1.1.0 版本的安装包，改为安装 3.0.0 版本的。

但是因为有同学反映删除重装后还会出现这个问题，所以我又申请了一台服务器，重新进行实验。

重新下载 3.0.0 版本安装包。

```
[root@ecs-7f28 soft]# wget https://opengauss.obs.cn-south-1.myhuaweicloud.com/3.0.0/opengauss-third_party_binarylibs.tar.gz
--2022-05-11 23:10:13-- https://opengauss.obs.cn-south-1.myhuaweicloud.com/3.0.0/opengauss-third_party_binarylibs.tar.gz
Resolving opengauss.obs.cn-south-1.myhuaweicloud.com (opengauss.obs.cn-south-1.myhuaweicloud.com)... 121.37.63.33, 139.159.208.243, 139.159.208.67, ...
Connecting to opengauss.obs.cn-south-1.myhuaweicloud.com (opengauss.obs.cn-south-1.myhuaweicloud.com)|121.37.63.33|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 2630884924 (2.4G) [application/gzip]
Saving to: 'openGauss-third_party_binarylibs.tar.gz'

openGauss-third_party_binarylibs.tar.gz 100%[=====] 2.45G 1.27MB/s in 32m 58s

2022-05-11 23:43:04 (1.27 MB/s) - 'openGauss-third_party_binarylibs.tar.gz' saved [2630884924/2630884924]
```

3、在我的第二次实验中，编译 openGauss-server 前需要进入到软件代码编译脚本目录，输入 “cd /openGauss-lab/soft/openGauss-server” 命令。但我输入该命令后发现该文件不存在。

```
[root@ecs-7f28 soft]# cd /openGauss-lab/soft/openGauss-server
-bash: cd: /openGauss-lab/soft/openGauss-server: No such file or directory
```

原因：我在用 Git 工具下载 openGauss-server 和 openGauss-OM 代码时，不小心把 “openGauss-server” 打成了 “opeGauss-server”。

```
[root@ecs-7f28 soft]# git clone https://gitee.com/wangjiaomei/opengauss-server.git opeGauss-server
Cloning into 'opeGauss-server'...
remote: Enumerating objects: 54372, done.
remote: Counting objects: 100% (54372/54372), done.
remote: Compressing objects: 100% (16680/16680), done.
```

我输入 “cd /openGauss-lab/soft/opeGauss-server” 命令，成功执行。

```
-bash: cd: /openGauss-lab/soft/opeGauss-server: No such file or directory
[root@ecs-7f28 soft]# cd /openGauss-lab/soft/opeGauss-server
[root@ecs-7f28 opeGauss-server]#
```

4、在验证二次开发结果的解压 openGauss 安装包步骤，我解压后发现缺少文件，没有 script 子目录。

```
[root@ecs-7f28 openGauss]# tar -zxvf openGauss-2.0.0-openEuler-64bit-om.tar.gz
tar (child): openGauss-2.0.0-openEuler-64bit-om.tar.gz: Cannot open: No such file or directory
tar (child): Error is not recoverable: exiting now
tar: Child returned status 2
tar: Error is not recoverable: exiting now
[root@ecs-7f28 openGauss]# ls
clusterconfig.xml                                openGauss-3.0.0-openEuler-64bit.sha256           upgrade_sql.sha256
openGauss-3.0.0-openEuler-64bit-Libpq.tar.gz      openGauss-3.0.0-openEuler-64bit-symbol.tar.gz    upgrade_sql.tar.gz
openGauss-3.0.0-openEuler-64bit-om.sha256         openGauss-3.0.0-openEuler-64bit.tar.bz2
openGauss-3.0.0-openEuler-64bit-om.tar.gz         openGauss-3.0.0-openEuler-64bit-tools.tar.gz
```

原因：这是因为前面下载的是 openGauss3.0.0 版本的安装包，而这里的解压

步骤用的是 2.0.0。将 2.0.0 改为 3.0.0 即可正常解压文件。修改命令，解压 openGauss 安装包之后，目录下的文件与实验指导手册中的一致，出现了 script 子目录。

```
[root@ecs-7f28 openGauss]# ls
clusterconfig.xml  openGauss-3.0.0-openEuler-64bit.sha256  simpleInstall
lib                openGauss-3.0.0-openEuler-64bit-symbol.tar.gz  upgrade_sql.sha256
openGauss-3.0.0-openEuler-64bit-libpq.tar.gz  openGauss-3.0.0-openEuler-64bit.tar.bz2  upgrade_sql.tar.gz
openGauss-3.0.0-openEuler-64bit-om.sha256  openGauss-3.0.0-openEuler-64bit-tools.tar.gz  version.cfg
openGauss-3.0.0-openEuler-64bit-om.tar.gz  script
```

三、实验耗费时长说明

本次实验用了两个半小时，时间主要花费在以下几个方面：

- 1、一些文件和安装包的下载、解压耗费了很长时间。
- 2、实验中途出现了下错安装包版本的问题，我重新申请服务台进行第二次实验。
- 3、粗心打错字母，“openGauss-server”打成“opeGauss-server”。当时没有想到会出现这种问题，花费了很多时间寻找错误原因。
- 4、修改了安装包版本后，我按照实验指导手册继续实验，忽视了 openGauss 版本的变化，导致后面又出现了因为文件版本不一致而产生的错误。

四、openGauss 其他二次开发创意说明（实现的或未实现的二次开发创意说明均可，实现的创意可说明具体实现步骤，未实现的创意可说明拟实现思路）。

想法：编写一个创建数据库的 cpp 文件，将它导入到 openGauss 中，在 openGauss 中通过某种方式执行该 cpp 文件，从而建立数据库，不需要在 openGauss 中写 SQL 语句就可以实现数据库的创建。