NSD DATABASE DAY01

1 构建MySQL服务器

1.1 问题

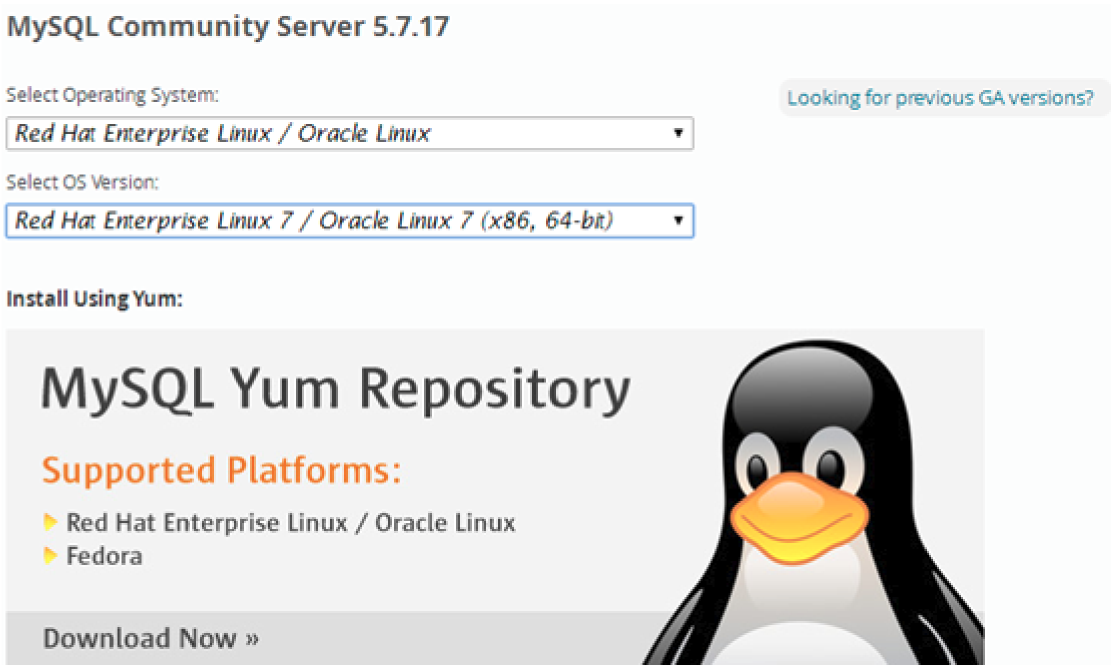
本案例要求熟悉MySQL官方安装包的使用，快速构建一台数据库服务器：

- 安装MySQL-server、MySQl-client软件包
- 修改数据库用户root的密码
- 确认MySQL服务程序运行、root可控

1.2 方案

本课程将使用64位的RHEL 7操作系统，MySQL数据库的版本是5.7.17。

访问http://dev.mysql.com/downloads/mysql/，找到MySQL Community Server下载页面，平台选择“Red Hat Enterprise Linux 7 / Oracle Linux”，然后选择64位的bundle整合包下载，如图-1所示。


MySQL Community Server 5.7.17

Select Operating System:

Red Hat Enterprise Linux / Oracle Linux

Select OS Version:

Red Hat Enterprise Linux 7 / Oracle Linux 7 (x86, 64-bit)

Install Using Yum:

Looking for previous GA versions?
MySQL Yum Repository
Supported Platforms:
Red Hat Enterprise Linux / Oracle Linux
Fedora
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图-1

注意：下载MySQL软件时需要以Oracle网站账户登录，如果没有请根据页面提示先注册一个（免费）。

1.3 步骤

实现此案例需要按照如下步骤进行。

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步骤一：准备工作

1）卸载系统自带的mariadb-server、mariadb软件包（如果有的话）

```
[root@dbsvr1 ~]# yum -y remove mariadb-server mariadb
Setting up Remove Process
No Match for argument: mariadb-server
rhel7dvd                                         | 3.9 kB     00:00 ...
Package(s) mariadb-server available, but not installed.
No Match for argument: mariadb
Package(s) mariadb available, but not installed.
No Packages marked for removal
```

2）清理/etc/my.cnf配置文件

此配置文件由RHEL自带的mariadb-libs库提供：

```
[root@dbsvr1 ~]# rpm -qf /etc/my.cnf
mariadb-libs-5.5.35-3.el7.x86_64
```

大量的系统软件包都需要用到mariadb-libs库，因此不建议直接卸载此软件包。最好是安装新的MySQL数据库软件时，采用 -U 升级的方式来进行替换。

配置文件/etc/my.cnf若不需要使用，可以直接删除。或者保险起见，也可以将其改名备份：

```
[root@dbsvr1 ~]# mv /etc/my.cnf /etc/my.cnf.old
```

步骤二：安装mysql-community-client、mysql-community-server软件包

1）释放bundle整合包

```
[root@dbsvr1 ~]# cd /var/ftp/pub/
[root@dbsvr1 pub]# tar xvf mysql-5.7.17-1.el7.x86_64.rpm-bundle.tar
mysql-community-client-5.7.17-1.el7.x86_64.rpm
//MySQL 数据库客户端应用程序和工具
mysql-community-common-5.7.17-1.el7.x86_64.rpm
//MySQL 数据库和客户端库共享文件
mysql-community-devel-5.7.17-1.el7.x86_64.rpm
//MySQL 数据库客户端应用程序的库和头文件
mysql-community-embedded-5.7.17-1.el7.x86_64.rpm
//MySQL嵌入式函数库
mysql-community-embedded-compat-5.7.17-1.el7.x86_64.rpm
```

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```
//MySQL嵌入式兼容函数库
mysql-community-embedded-devel-5.7.17-1.el7.x86_64.rpm
//头文件和库文件作为Mysql的嵌入式库文件
mysql-community-libs-5.7.17-1.el7.x86_64.rpm
//MySQL 数据库客户端应用程序的共享库
mysql-community-libs-compat-5.7.17-1.el7.x86_64.rpm
//MySQL 5.6.31 数据库客户端应用程序的共享兼容库
mysql-community-minimal-debuginfo-5.7.17-1.el7.x86_64.rpm
//mysql最小安装包的调试信息
mysql-community-server-5.7.17-1.el7.x86_64.rpm
//非常快速和可靠的 SQL 数据库服务器
mysql-community-server-minimal-5.7.17-1.el7.x86_64.rpm
//非常快速和可靠的 SQL 数据库服务器(最小化安装)
mysql-community-test-5.7.17-1.el7.x86_64.rpm
//MySQL 数据库服务器的测试套件
```

2）安装MySQL数据库

在bundle的整合包中，并不是所有的rpm包都会用到，将一些重复的删除。

安装mysql时可能会缺少某些依赖包，需提前单独安装

```
[root@dbsvr1 pub]#yum -y  install perl-Data-Dumper  perl-JSON  perl-Time-HiRes
[root@dbsvr1 pub]# rpm -Uvh mysql-community-*.rpm
准备中...                          ################################# [100%]
正在升级/安装...
   1:mysql-community-common-5.7.17-1.e################################# [  9%]
   2:mysql-community-libs-5.7.17-1.el7################################# [ 18%]
   3:mysql-community-client-5.7.17-1.e################################# [ 27%]
   4:mysql-community-server-5.7.17-1.e################################# [ 36%]
   5:mysql-community-devel-5.7.17-1.el################################# [ 45%]
   6:mysql-community-embedded-5.7.17-1################################# [ 55%]
   7:mysql-community-embedded-devel-5.################################# [ 64%]
   8:mysql-community-test-5.7.17-1.el7################################# [ 73%]
   9:mysql-community-libs-compat-5.7.1################################# [ 82%]
  10:mysql-community-minimal-debuginfo################################# [ 91%]
正在清理/删除...
  11:mariadb-libs-1:5.5.35-3.el7      ################################# [100%]
[root@dbsvr1 pub]#systemctl start mysqld.service
```

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安装过程中会尝试做一些检测，然后完成基本的初始化任务，期间会给出相关的提示。比如由于MySQL 5.7对TIMESTAMP时间戳的处理不同于之前的版本，会给出警告和提示出解决办法（使

用--explicit_defaults_for_timestamp选项）：

```
2017-04-04T15:59:07.324470Z 0 [Warning] TIMESTAMP with implicit DEFAULT value is dep
```

MySQL 5.7默认采用的存储引擎不再是MyISAM，而是InnoDB。初始化时若相关的文件不存在，会自动创建并设置相关参数：

```
2017-04-04T15:59:09.075698Z 0 [Warning] InnoDB: New log files created, LSN=45790
2017-04-04T15:59:09.381634Z 0 [Warning] InnoDB: Creating foreign key constraint syste
2017-04-04T15:59:09.579733Z 0 [Warning] No existing UUID has been found, so we assu
2017-04-04T15:59:09.703759Z 0 [Warning] Gtid table is not ready to be used. Table 'my
2017-04-04T15:59:09.711439Z 1 [Note] A temporary password is generated for root@lo
2017-04-04T15:59:29.758102Z 1 [ERROR] Failed to open the bootstrap file /tmp/install-v
2017-04-04T15:59:29.758122Z 1 [ERROR] 1105 Bootstrap file error, return code (0). Nea
'
2017-04-04T15:59:29.758336Z 0 [ERROR] Aborting

2017-04-04T15:59:33.078575Z 0 [Warning] TIMESTAMP with implicit DEFAULT value is dep
2017-04-04T15:59:33.092082Z 0 [Note] /usr/sbin/mysqld (mysqld 5.7.17) starting as pr
2017-04-04T15:59:33.095074Z 0 [Note] InnoDB: PUNCH HOLE support available
2017-04-04T15:59:33.095104Z 0 [Note] InnoDB: Mutexes and rw_locks use GCC atomic bu
2017-04-04T15:59:33.095109Z 0 [Note] InnoDB: Uses event mutexes
2017-04-04T15:59:33.095112Z 0 [Note] InnoDB: GCC builtin __atomic_thread_fence() is u
2017-04-04T15:59:33.095115Z 0 [Note] InnoDB: Compressed tables use zlib 1.2.3
2017-04-04T15:59:33.095120Z 0 [Note] InnoDB: Using Linux native AIO
2017-04-04T15:59:33.095340Z 0 [Note] InnoDB: Number of pools: 1
2017-04-04T15:59:33.095428Z 0 [Note] InnoDB: Not using CPU crc32 instructions
2017-04-04T15:59:33.096904Z 0 [Note] InnoDB: Initializing buffer pool, total size = 128M
2017-04-04T15:59:33.106888Z 0 [Note] InnoDB: Completed initialization of buffer pool
2017-04-04T15:59:33.108711Z 0 [Note] InnoDB: If the mysqld execution user is authorize
2017-04-04T15:59:33.120189Z 0 [Note] InnoDB: Highest supported file format is Barracu
2017-04-04T15:59:33.454908Z 0 [Note] InnoDB: Creating shared tablespace for tempora
2017-04-04T15:59:33.455034Z 0 [Note] InnoDB: Setting file './ibtmp1' size to 12 MB. Phy
2017-04-04T15:59:34.057704Z 0 [Note] InnoDB: File './ibtmp1' size is now 12 MB.
2017-04-04T15:59:34.058603Z 0 [Note] InnoDB: 96 redo rollback segment(s) found. 96
2017-04-04T15:59:34.058615Z 0 [Note] InnoDB: 32 non-redo rollback segment(s) are ac
2017-04-04T15:59:34.063078Z 0 [Note] InnoDB: Waiting for purge to start
2017-04-04T15:59:34.113304Z 0 [Note] InnoDB: 5.7.17 started; log sequence number 25
2017-04-04T15:59:34.113841Z 0 [Note] InnoDB: Loading buffer pool(s) from /var/lib/m
```

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```
2017-04-04T15:59:34.114310Z 0 [Note] Plugin 'FEDERATED' is disabled.
2017-04-04T15:59:34.118690Z 0 [Note] Found ca.pem, server-cert.pem and server-key.
2017-04-04T15:59:34.118921Z 0 [Warning] CA certificate ca.pem is self signed.
2017-04-04T15:59:34.119582Z 0 [Note] InnoDB: Buffer pool(s) load completed at 17040
2017-04-04T15:59:34.237643Z 0 [Note] Server hostname (bind-address): '*'; port: 33
2017-04-04T15:59:34.241687Z 0 [Note] IPv6 is available.
2017-04-04T15:59:34.241727Z 0 [Note]   - '::' resolves to '::';
2017-04-04T15:59:34.241753Z 0 [Note] Server socket created on IP: '::'.
2017-04-04T15:59:34.313591Z 0 [Note] Event Scheduler: Loaded 0 events
2017-04-04T15:59:34.313686Z 0 [Note] Executing 'SELECT * FROM INFORMATION_SCHEM
2017-04-04T15:59:34.313693Z 0 [Note] Beginning of list of non-natively partitioned table
2017-04-04T15:59:34.322126Z 0 [Note] End of list of non-natively partitioned tables
2017-04-04T15:59:34.322261Z 0 [Note] /usr/sbin/mysqld: ready for connections.
Version: '5.7.17'  socket: '/var/lib/mysql/mysql.sock'  port: 3306  MySQL Community Se
```

关于MySQL数据库的管理员账号root，其密码也不再是空，而是安装时随机生成一个，这种处理方式一定程度上增强了MySQl服务器的安全性。随机生成的密码字串可以从保存到mysql日志文件中找到：

```
[root@dbsvr1 pub]#grep 'temporary password' /var/log/mysqld.log
2017-04-04T15:59:09.711439Z 1 [Note] A temporary password is generated for root@loc
```

3）确认安装后的服务单元文件、服务状态

查看服务单元文件

```
[root@dbsvr1 pub]# ls -lh /usr/lib/systemd/system/mysqld.service
-rw-r--r--. 1 root root 1.6K 11月 29 04:30 /usr/lib/systemd/system/mysqld.service
```

mysql服务的自启状态为enabled：

```
[root@dbsvr1 ~]# # systemctl  is-enabled  mysqld.service
enabled
```

步骤三：查看Mysql服务的运行状态

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服务器进程为mysqld，监听的默认端口为TCP 3306：

```
[root@dbsvr1 pub]# netstat -antpu | grep mysql
tcp6       0      0 :::3306                 :::*                    LISTEN      3913/mysqld
```

查看Mysql服务的状态

```
[root@dbsvr1 pub]#systemctl is-active mysqld.service
active
[root@dbsvr1 pub]#systemctl status mysqld.service
mysqld.service - MySQL Server
   Loaded: loaded (/usr/lib/systemd/system/mysqld.service; enabled)
   Active: active (running) since 日 2017-04-23 08:56:24 CST; 1s ago
     Docs: man:mysqld(8)
           http://dev.mysql.com/doc/refman/en/using-systemd.html
  Process: 13753 ExecStart=/usr/sbin/mysqld --daemonize --pid-file=/var/run/mysqld/my
  Process: 13732 ExecStartPre=/usr/bin/mysqld_pre_systemd (code=exited, status=0/SUC
 Main PID: 13757 (mysqld)
   CGroup: /system.slice/mysqld.service
           └─13757 /usr/sbin/mysqld --daemonize --pid-file=/var/run/mysqld/mysqld.pid
```

数据库的默认存放位置为 /var/lib/mysql：

```
[root@dbsvr1 pub]# ls /var/lib/mysql
auto.cnf    client-cert.pem  ibdata1     ibtmp1     mysql.sock.lock     public_key.pem   sys
ca-key.pem  client-key.pem   ib_logfile0 mysql      performance_schema  server-cert.pem
ca.pem      ib_buffer_pool   ib_logfile1 mysql.sock private_key.pem     server-key.pem
```

步骤四：连接MySQL服务器，修改密码

查看随机生成的root管理密码

```
[root@dbsvr1 pub]#grep 'temporary password' /var/log/mysqld.log
2017-04-01T18:10:42.948679Z 1 [Note] A temporary password is generated for root@loc
```

2）使用客户端命令mysql连接到MySQL服务器

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提示验证时，填入前一步获得的随机密码，验证成功后即可进入“mysql> ”环境：

```
[root@dbsvr1 pub]# mysql -u root -p
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 14
Server version: 5.7.17

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owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql>                              //登录成功后，进入SQL操作环境
```

用该密码登录到服务端后，必须马上修改密码，不然会报如下错误：

```
mysql> show databases;
ERROR 1820 (HY000): You must reset your password using ALTER USER statement before
```

3）执行SET PASSWORD命令修改密码

这个其实与validate_password_policy的值有关，默认为1，所以刚开始设置的密码必须符合长度，且必须含有数字，小写或大写字母，特殊字符。如果我们不希望密码设置的那么复杂，需要修改两个全局参数：validate_password_policy与validate_password_length。validate_password_length默认值为8,最小值为4，如果你显性指定validate_password_length的值小于4，尽管不会报错，但validate_password_length的值将设为4。

可参考下列指令：

```
mysql>set global validate_password_policy=0;
mysql>set global validate_password_length=4;
mysql> SET PASSWORD FOR 'root'@'localhost'=PASSWORD('1234567');
Query OK, 0 rows affected, 1 warning (0.00 sec)
```

上述操作的结果是——更改数据库用户root从本机访问时的密码，设为1234567。

退出“mysql>”环境，重新登录验证，必须采用新的密码才能登入：

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```
mysql> exit                              //退出 mysql> 环境
```

```
Bye
[root@dbsvr1 ~]# mysql -u root –p            //重新登录
Enter password:                         //输入新设置的密码
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 15
Server version: 5.7.17 MySQL Community Server (GPL)

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Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> mysql> show databases;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| mysql              |
| performance_schema |
| sys                |
+--------------------+
4 rows in set (0.07 sec)
```

2 数据库基本管理

2.1 问题

本案例要求熟悉MySQL的连接及数据库表的增删改查等基本管理操作，主要完成以下几个方便的操作：

- 使用mysql命令连接数据库
- 练习查看/删除/创建库的相关操作
- 练习查看/删除/创建表的相关操作，表数据参考如表-1所示内容

表 - 1 测试用表数据

学号	姓名	性别	手机号	通信地址
NSD131201	张三	男	13012345678	朝阳区劲松南路.. ..
NSD131202	韩梅梅	女	13722223333	海淀区北三环西路..
NSD131203	王五	男	18023445678	丰台区兴隆中街.. ..

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2.2 步骤

实现此案例需要按照如下步骤进行。

步骤一：使用mysql命令连接数据库

连接MySQL服务器时，最基本的用法是通过 -u 选项指定用户名、-p指定密码。密码可以写在命令行（如果不写，则出现交互，要求用户输入），当然基于安全考虑一般不推荐这么做：

```
[root@dbsvr1 ~]# mysql -uroot -p123456          //紧挨着选项，不要空格
mysql: [Warning] Using a password on the command line interface can be insecure.
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 16
Server version: 5.7.17 MySQL Community Server (GPL)

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owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> exit                                //退出已登录的mysql> 环境
Bye
```

默认情况下，msyql命令会连接本机的MySQL服务。但在需要的时候，可以通过 -h 选项指定远程主机；如果端口不是3306，还可以通过大写的 -P 选项指定：

```
[root@dbsvr1 ~]# mysql -u root -p -h 127.0.0.1 -P 3306
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 17
Server version: 5.7.17 MySQL Community Server (GPL)

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owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.
```

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```

mysql> exit                          //退出已登录的mysql> 环境
Bye
```

连接其他主机的MySQL服务，有一个前提条件——对方已经添加了此用户从此客户机访问的数据库授权，授权操作方法会在后续课程学习。

步骤二：练习查看/删除/创建库的相关操作

以root用户登入“mysql> ”环境后，可以执行各种MySQL指令、SQL指令。基本的用法事项如下：

- 操作指令不区分大小写（库名/表名、密码、变量值等除外）。
- 每条SQL指令以；结束或分隔。
- 不支持 Tab 键自动补齐。
- \c 可废弃当前编写错的操作指令。

1）查看现有的库

```
mysql> SHOW DATABASES;
+--------------------+
| Database           |
+--------------------+
| information_schema |                 //信息概要库
| mysql              |                 //授权库
| performance_schema |                 //性能结构库
| sys                |                 //系统元数据库
+--------------------+
4 rows in set (0.15 sec)
```

2）切换/使用指定的库

切换到sys库：

```
mysql> USE sys;
Database changed
mysql> SELECT DATABASE();             //确认当前所在的库
+------------+
| DATABASE() |
+------------+
| sys        |
+------------+
1 row in set (0.00 sec)
```

Top

切换到mysql库：

```
mysql> USE mysql;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> SELECT DATABASE();                    //确认当前所在的库
+------------+
| DATABASE() |
+------------+
| mysql      |
+------------+
1 row in set (0.00 sec)
```

3）创建新的库

新建名为mydb的库，确认结果：

```
mysql> CREATE DATABASE mydb;
Query OK, 1 row affected (0.00 sec)

mysql> SHOW DATABASES;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| mydb               |                    //新建的mydb库
| mysql              |
| performance_schema |
| sys                |
+--------------------+
5 rows in set (0.00 sec)
```

新建名为newdb的库，确认结果：

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```
mysql> CREATE DATABASE newdb;
Query OK, 1 row affected (0.00 sec)
```

```

mysql> SHOW DATABASES;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| mydb               |                    //新建的mydb库
| mysql              |
| newdb              |                    //新建的newdb库
| performance_schema |
| sys                |
+--------------------+
6 rows in set (0.00 sec)
```

新建数据库以后，会为每个数据库建立同名文件夹，可从命令行确认：

```
[root@dbsvr1 ~]# ls -l /var/lib/mysql/{my,new}db/
/var/lib/mysql/mydb/:
总用量 4
-rw-r-----. 1 mysql mysql 65 4月   2 03:14 db.opt

/var/lib/mysql/newdb/:
总用量 4
-rw-r-----. 1 mysql mysql 65 4月   2 03:15 db.opt
```

4）删除指定的库

删除名为newdb的库：

```
mysql> DROP DATABASE newdb;
Query OK, 0 rows affected (0.04 sec)

mysql> SHOW DATABASES;                    //确认删除结果，已无newdb表
+--------------------+
| Database           |
+--------------------+
| information_schema |
| mydb               |
| mysql              |
| performance_schema |
```

Top

```
| sys                |
+--------------------+
5 rows in set (0.00 sec)
```

步骤三：练习查看/删除/创建表的相关操作

1）查看指定的库里有哪些表

查看mysql库里有哪些表：

```
mysql> USE mysql;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> SHOW TABLES;
+---------------------------+
| Tables_in_mysql           |
+---------------------------+
| columns_priv              |
| db                        |
| engine_cost               |
| event                     |
| func                      |
| general_log               |
| gtid_executed             |
| help_category             |
| help_keyword              |
| help_relation             |
| help_topic                |
| innodb_index_stats        |
| innodb_table_stats        |
| ndb_binlog_index          |
| plugin                    |
| proc                      |
| procs_priv                |
| proxies_priv              |
| server_cost               |
| servers                   |
| slave_master_info         |
| slave_relay_log_info      |
| slave_worker_info         |
```

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```
| slow_log                  |
| tables_priv               |
| time_zone                 |
| time_zone_leap_second     |
| time_zone_name            |
| time_zone_transition      |
| time_zone_transition_type |
| user                      |                  //存放数据库用户的表
+---------------------------+
31 rows in set (0.00 sec)
```

2）查看指定表的字段结构

当前库为mysql，查看columns_priv表的结构，以列表形式展现：

```
mysql> DESCRIBE columns_priv\G              //末尾不用分号
*************************** 1. row ***************************
  Field: Host
   Type: char(60)
   Null: NO
    Key: PRI
Default:
  Extra:
*************************** 2. row ***************************
  Field: Db
   Type: char(64)
   Null: NO
    Key: PRI
Default:
  Extra:
*************************** 3. row ***************************
  Field: User
   Type: char(32)
   Null: NO
    Key: PRI
Default:
  Extra:
*************************** 4. row ***************************
  Field: Table_name
   Type: char(64)
   Null: NO
```

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```
    Key: PRI
Default:
  Extra:
*************************** 5. row ***************************
  Field: Column_name
   Type: char(64)
   Null: NO
    Key: PRI
Default:
  Extra:
*************************** 6. row ***************************
  Field: Timestamp
   Type: timestamp
   Null: NO
    Key:
Default: CURRENT_TIMESTAMP
  Extra: on update CURRENT_TIMESTAMP
*************************** 7. row ***************************
  Field: Column_priv
   Type: set('Select','Insert','Update','References')
   Null: NO
    Key:
Default:
  Extra:
7 rows in set (0.01 sec)
```

查看columns_priv表的结构，以表格形式展现：

```
mysql> DESCRIBE columns_priv;               //末尾需要有分号
+-------------+----------------------------------------------+------+-----+
| Field       | Type                                         | Null | Key | Default           | Extra
+-------------+----------------------------------------------+------+-----+
| Host        | char(60)                                     | NO   | PRI |                   |
| Db          | char(64)                                     | NO   | PRI |                   |
| User        | char(32)                                     | NO   | PRI |                   |
| Table_name  | char(64)                                     | NO   | PRI |                   |
| Column_name | char(64)                                     | NO   | PRI |                   |
| Timestamp   | timestamp                                    | NO   |     | CURRENT_TIMESTAMP | or
| Column_priv | set('Select','Insert','Update','References') | NO   |     |                   |
+-------------+----------------------------------------------+------+-----+
```

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```
7 rows in set (0.00 sec)
```

上述操作中，DESCRIBE可缩写为DESC；另外，当引用非当前库中的表时，可以用“库名.表名”的形式。比如，切换为mysql库再执行“DESCRIBE columns_priv;”，与以下操作的效果是相同的：

```
mysql> DESC mysql.columns_priv;
+-------------+----------------------------------------------+------+-----+
| Field       | Type                                         | Null | Key | Default           | Extra
+-------------+----------------------------------------------+------+-----+
| Host        | char(60)                                     | NO   | PRI |                   |
| Db          | char(64)                                     | NO   | PRI |                   |
| User        | char(16)                                     | NO   | PRI |                   |
| Table_name  | char(64)                                     | NO   | PRI |                   |
| Column_name | char(64)                                     | NO   | PRI |                   |
| Timestamp   | timestamp                                    | NO   |     | CURRENT_TIMESTAMP | or
| Column_priv | set('Select','Insert','Update','References') | NO   |     |                   |
+-------------+----------------------------------------------+------+-----+
7 rows in set (0.00 sec)
```

3）在test库中创建一个名为pwlist的表

包括name、password两列，其中name列作为主键。两个字段值均不允许为空，其中密码列赋予默认空值，相关操作如下所述。

切换到mydb库：

```
mysql> USE mydb;
Database changed
```

新建pwlist表：

```
mysql> CREATE TABLE pwlist(
    -> name CHAR(16) NOT NULL,
    -> password CHAR(48) DEFAULT '',
    -> PRIMARY KEY(name)
    -> );
Query OK, 0 rows affected (0.38 sec)
```

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确认新创建的表：

```
mysql> SHOW TABLES;
+-----------------+
| Tables_in_mydb |
+-----------------+
| pwlist        |                   //新建的pwlist表
+-----------------+
1 rows in set (0.01 sec)
```

查看pwlist表的字段结构：

```
mysql> DESC pwlist;
+----------+----------+------+-----+---------+-------+
| Field    | Type     | Null | Key | Default | Extra |
+----------+----------+------+-----+---------+-------+
| name     | char(16) | NO   | PRI | NULL    |       |
| password | char(48) | YES  |     |         |       |
+----------+----------+------+-----+---------+-------+
2 rows in set (0.01 sec)
```

4）删除指定的表

删除当前库中的pwlist表：

```
mysql> DROP TABLE pwlist;
Query OK, 0 rows affected (0.01 sec)
```

确认删除结果：

```
mysql> SHOW TABLES;
Empty set (0.00 sec)
```

5）在mydb库中创建一个学员表

表格结构及数据内容如表-1所示。 Top

在MySQL表内存储中文数据时，需要更改字符集（默认为latin1不支持中文），以便MySQL支持存储中文数据记录；比如，可以在创建库或表的时候，手动添加“DEFAULT

CHARSET=utf8”来更改字符集。

根据上述表格结构，创建支持中文的student表：

```
mysql> CREATE TABLE mydb.student(
    -> 学号 char(9) NOT NULL,
    -> 姓名 varchar(4) NOT NULL,
    -> 性别 enum('男','女') NOT NULL,
    -> 手机号 char(11) DEFAULT '',
    -> 通信地址 varchar(64),
    -> PRIMARY KEY(学号)
    -> ) DEFAULT CHARSET=utf8;          //手工指定字符集，采用utf8
Query OK, 0 rows affected (0.31sec)
```

查看student表的字段结构：

```
mysql> DESC mydb.student;
+-------------+-----------------+------+-----+---------+-------+
| Field       | Type            | Null | Key | Default | Extra |
+-------------+-----------------+------+-----+---------+-------+
| 学号        | char(9)         | NO   | PRI | NULL    |       |
| 姓名        | varchar(4)      | NO   |     | NULL    |       |
| 性别        | enum('男','女') | NO   |     | NULL    |       |
| 手机号      | char(11)        | YES  |     |         |       |
| 通信地址    | varchar(64)     | YES  |     | NULL    |       |
+-------------+-----------------+------+-----+---------+-------+
5 rows in set (0.04 sec)
```

查看student表的实际创建指令：

```
mysql> SHOW CREATE TABLE mydb.student;
+---------+------------------------------------------------
| Table   | Create Table
+---------+------------------------------------------------
| student | CREATE TABLE `student` (
  `学号` char(9) NOT NULL,
  `姓名` varchar(4) NOT NULL,
  `性别` enum('男','女') NOT NULL,
  `手机号` char(11) DEFAULT '',
```

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```
  `通信地址` varchar(64) DEFAULT NULL,
  PRIMARY KEY (`学号`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8          |
+--------+--------------------------------------------------------------
1 row in set (0.00 sec)
```

注意：若要修改MySQL服务的默认字符集，可以更改服务器的my.cnf配置文件，添加character_set_server=utf8 配置，然后重启数据库服务。

```
[root@dbsvr1 ~]# vim /etc/my.cnf                    //修改运行服务配置
[mysqld]
.. ..
character_set_server=utf8

[root@dbsvr1 ~]# systemctl restart mysqld              //重启服务
.. ..
[root@dbsvr1 ~]# mysql – u root -p
Enter password:
.. ..
mysql> SHOW VARIABLES LIKE 'character%';              //确认更改结果
+--------------------------+----------------------------+
| Variable_name            | Value                      |
+--------------------------+----------------------------+
| character_set_client     | utf8                       |
| character_set_connection | utf8                       |
| character_set_database   | utf8                       |
| character_set_filesystem | binary                     |
| character_set_results    | utf8                       |
| character_set_server     | utf8                       |
| character_set_system     | utf8                       |
| character_sets_dir       | /usr/share/mysql/charsets/ |
+--------------------------+----------------------------+
8 rows in set (0.03 sec)
```

3 MySQL 数据类型

3.1 问题

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本案例要求熟悉MySQL的字段数据类型、时间函数的使用，完成以下任务操作：

- 在home库里创建famliy表，表结构、字段类型自定义

- 练习各种时间函数的使用

3.2 步骤

实现此案例需要按照如下步骤进行。

步骤一：创建home库、family表

1）新建home库，并切换到home库

```
mysql> CREATE DATABASE home;
Query OK, 1 row affected (0.00 sec)
mysql> USE home;
Database changed
```

2）新建family表

假定family表用来记录每个家庭成员的姓名（name）、性别（gender）、出生日期（birth）、职业（job）、与户主关系（relation）。

```
mysql> CREATE TABLE family(
    -> name varchar(16) NOT NULL,
    -> gender enum('male','femal') DEFAULT 'male',
    -> birth date NOT NULL,
    -> job varchar(16) DEFAULT '',
    -> relation varchar(24) NOT NULL,
    -> PRIMARY KEY(name)
    -> );
Query OK, 0 rows affected (0.61 sec)
```

查看family表的字段结构：

```
mysql> DESC family;
+----------+----------------------+------+-----+---------+-------+
| Field    | Type                 | Null | Key | Default | Extra |
+----------+----------------------+------+-----+---------+-------+
| name     | varchar(16)          | NO   | PRI | NULL    |       |
| gender   | enum('male','femal') | YES  |     | male    |       |
| birth    | date                 | NO   |     | NULL    |       |
| job      | varchar(16)          | YES  |     |         |       |
| relation | varchar(24)          | NO   |     | NULL    |       |
+----------+----------------------+------+-----+---------+-------+
```

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```
5 rows in set (0.00 sec)
```

步骤二：练习各种时间函数的使用

1）使用now()查看当前的日期和时间

```
mysql> SELECT now();
+---------------------+
| now()               |
+---------------------+
| 2017-04-02 04:02:42 |
+---------------------+
1 row in set (0.00 sec)
```

2）使用sysdate()查看系统日期和时间

```
mysql> SELECT sysdate();
+---------------------+
| sysdate()           |
+---------------------+
| 2017-04-02 04:03:21 |
+---------------------+
1 row in set (0.00 sec)
```

3）使用curdate()获得当前的日期，不含时间

```
mysql> SELECT curdate();
+------------+
| curdate()  |
+------------+
| 2017-04-02 |
+------------+
1 row in set (0.00 sec)
```

4）使用curtime()获得当前的时间，不含日期

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```
mysql> SELECT curtime();
```

```
+----------+
| curtime() |
+----------+
| 04:04:55 |
+----------+
1 row in set (0.00 sec)
```

5）分别获取当前日期时间中的年份、月份、日

```
mysql> SELECT year(now()),month(now()),day(now());
+-----------+-------------+----------+
| year(now()) | month(now()) | day(now()) |
+-----------+-------------+----------+
|        2017 |            4 |          2 |
+-----------+-------------+----------+
1 row in set (0.00 sec)
```

6）获取系统日期时间中的月份、日

```
mysql> SELECT month(sysdate()),day(sysdate());
+---------------+--------------+
| month(sysdate()) | day(sysdate()) |
+---------------+--------------+
|                4 |              2 |
+---------------+--------------+
1 row in set (0.00 sec)
```

7）获取系统日期时间中的时刻

```
mysql> SELECT time(sysdate());
+---------------+
| time(sysdate()) |
+---------------+
| 04:06:08        |
+---------------+
1 row in set (0.00 sec)
```

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4 表结构的调整

4.1 问题

本案例要求熟悉MySQL库中表的字段修改，主要练习以下操作：

- 添加字段
- 修改字段名
- 修改字段类型
- 删除字段

4.2 步骤

实现此案例需要按照如下步骤进行。

步骤一：添加字段

在home中创建tea6表

```
mysql> CREATE TABLE home.tea6(id int(4) PRIMARY KEY,
    -> name varchar(4) NOT NULL,
    -> age int(2) NOT NULL
    -> );
Query OK, 0 rows affected (0.34 sec)
```

为tea6表添加一个address字段

添加前：

```
mysql> DESC tea6;
+-------+------------+------+-----+---------+-------+
| Field | Type       | Null | Key | Default | Extra |
+-------+------------+------+-----+---------+-------+
| id    | int(4)     | NO   | PRI | NULL    |       |
| name  | varchar(4) | NO   |     | NULL    |       |
| age   | int(2)     | NO   |     | NULL    |       |
+-------+------------+------+-----+---------+-------+
3 rows in set (0.00 sec)
```

添加address字段：

```
mysql> ALTER TABLE tea6 ADD address varchar(48);
Query OK, 0 rows affected (0.84 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

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添加后（默认作为最后一个字段）：

```
mysql> DESC tea6;
+---------+-------------+------+-----+---------+-------+
| Field   | Type        | Null | Key | Default | Extra |
+---------+-------------+------+-----+---------+-------+
| id      | int(4)      | NO   | PRI | NULL    |       |
| name    | varchar(4)  | NO   |     | NULL    |       |
| age     | int(2)      | NO   |     | NULL    |       |
| address | varchar(48) | YES  |     | NULL    |       |
+---------+-------------+------+-----+---------+-------+
4 rows in set (0.00 sec)
```

3）在tea6表的age列之后添加一个gender字段

添加操作：

```
mysql> ALTER TABLE tea6 ADD gender enum('boy','girl') AFTER age;
Query OK, 0 rows affected (0.59 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

确认添加结果：

```
mysql> DESC tea6;
+---------+--------------------+------+-----+---------+-------+
| Field   | Type               | Null | Key | Default | Extra |
+---------+--------------------+------+-----+---------+-------+
| id      | int(4)             | NO   | PRI | NULL    |       |
| name    | varchar(4)         | NO   |     | NULL    |       |
| age     | int(2)             | NO   |     | NULL    |       |
| gender  | enum('boy','girl') | YES  |     | NULL    |       |
| address | varchar(48)        | YES  |     | NULL    |       |
+---------+--------------------+------+-----+---------+-------+
5 rows in set (0.00 sec)
```

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步骤二：修改字段名和字段类型

将tea6表的gender字段改名为sex，并添加非空约束

修改操作：

```
mysql> ALTER TABLE tea6 CHANGE gender
    -> sex enum('boy','girl') NOT NULL;
Query OK, 0 rows affected (0.08 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

确认修改结果：

```
mysql> DESC tea6;
+---------+---------------------+------+-----+---------+-------+
| Field   | Type                | Null | Key | Default | Extra |
+---------+---------------------+------+-----+---------+-------+
| id      | int(4)              | NO   | PRI | NULL    |       |
| name    | varchar(4)          | NO   |     | NULL    |       |
| age     | int(2)              | NO   |     | NULL    |       |
| sex     | enum('boy','girl')  | NO   |     | NULL    |       |
| address | varchar(48)         | YES  |     | NULL    |       |
+---------+---------------------+------+-----+---------+-------+
5 rows in set (0.00 sec)
```

步骤三：删除字段

删除tea6表中名为sex的字段：

```
mysql> ALTER TABLE tea6 DROP sex;                    //删除操作
Query OK, 0 rows affected (0.52 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql> DESC tea6;                               //确认删除结果
+---------+-------------+------+-----+---------+-------+
| Field   | Type        | Null | Key | Default | Extra |
+---------+-------------+------+-----+---------+-------+
| id      | int(4)      | NO   | PRI | NULL    |       |
| name    | varchar(4)  | NO   |     | NULL    |       |
| age     | int(2)      | NO   |     | NULL    |       |
| address | varchar(48) | YES  |     | NULL    |       |
+---------+-------------+------+-----+---------+-------+
4 rows in set (0.00 sec)
```

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