



Memcached 原理和使用详解

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Tech Talk 目录索引

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- 一些技巧
- Q&A

Memcached介绍:

什么是Memcached?

Memcached是国外社区网站 LiveJournal 的开发团队开发的高性能的分布式内存缓存服务器。一般的使用目的是,通过缓存数据库查询结果,减少数据库访问次数,以提高动态Web应用的速度、提高可扩展性。

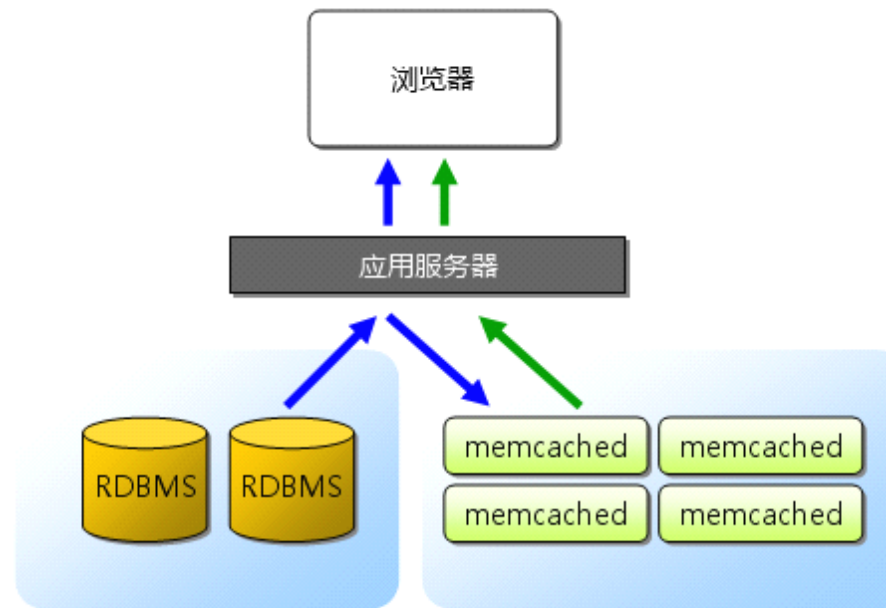
LiveJournal 团队开发了包括 **Memcached**、**MogileFS**、**Perlbal** 等不错的开源项目。

官方网站: <http://www.danga.com/memcached/>



Memcached介绍

Memcached运行图



- ➡ 首次访问：从RDBMS中取得数据保存到memcached
- ➡ 第二次后：从memcached中取得数据显示页面

Memcached介绍

谁在用Memcached?

国外

YAHOO!

facebook

twitter

mixi β version



国内

新浪网 sina.com.cn

校内 xiaonei

豆瓣 douban

开心网

YUPoo

搜狐 sohu.com

赶集 ganji.com

Memcached介绍

与Memcached类似的还有什么？

国外

Tokyo Cabinet: <http://tokyocabinet.sourceforge.net/index.html> (日本 mixi.jp 公司开发)

国内

MemcacheDB: <http://memcachedb.org> (新浪开源Team开发)

tmcache: <http://heiyeluren.googlecode.com> (偶开发的 ^_^)

Memcached介绍

Memcached的主要特点

- 基于C/S架构，协议简单
- 基于libevent的事件处理
- 自主内存存储处理
- 基于客户端的Memcached分布式

Memcached介绍

基于C/S架构，协议简单

```
memcached-1.2.0
[0]#
[0]# memcached -d -m 10 -u root -l 192.168.0.200 -p 12001 -P /tmp/mem.pid -vv
now 268435456
on not implemented
[0]# slab class 1: chunk size      80 perslab 13107
    100 perslab 10485
    128 perslab  8192
    160 perslab  6553
```

```
C:\WINDOWS\system32\cmd.exe
C:\Documents and Settings\heiyeluren>telnet 192.168.0.200 12000
```

```
C:\ Telnet 192.168.0.200
set abc 0 60 10
1234567890
STORED
get abc
VALUE abc 0 10
1234567890
END
replace abc 0 120 10
abcdefgjh
STORED
get abc
VALUE abc 0 10
abcdefgjh
END
delete abc
DELETED
get abc
END
set abc 0 60 10
0987654321
STORED
flush_all
OK
get abc
END
```


Memcached介绍

基于libevent的事件处理

libevent是一套跨平台的事件处理接口的封装，能够兼容包括这些操作系统：Windows/Linux/BSD/Solaris 等操作系统的的事件处理。

包装的接口包括：

`poll`、`select`(Windows)、`epoll`(Linux)、`kqueue`(BSD)、`/dev/pool`(Solaris)

Memcached 使用libevent来进行网络并发连接的处理，能够保持在很大并发情况下，仍旧能够保持快速的响应能力。

libevent: <http://www.monkey.org/~provos/libevent/>

Memcached介绍

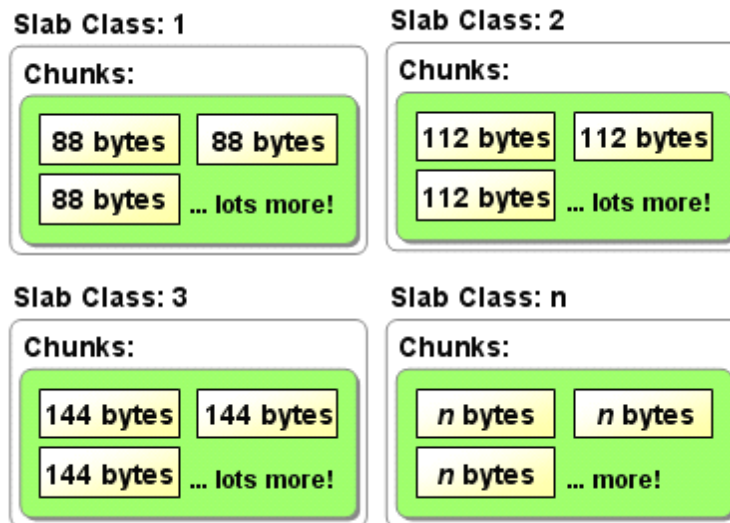
自主的内存存储处理

- 数据存储方式: Slab Allocation
- 数据过期方式: Lazy Expiration + LRU

Memcached介绍

数据存储方式: Slab Allocation

Slab Allocation 构造图



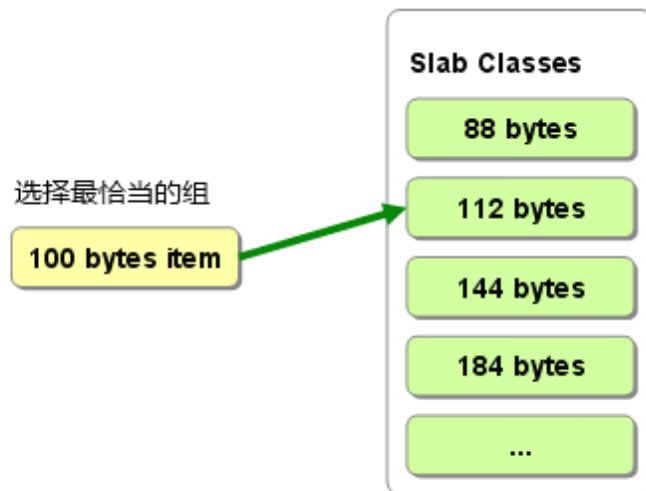
Slab Allocator的基本原理是按照预先规定的大小，将分配的内存分割成特定长度的块，以完全解决内存碎片问题。

Slab Allocation的原理相当简单。将分配的内存分割成各种尺寸的块（chunk），并把尺寸相同的块分成组（chunk的集合）

Memcached介绍

数据存储方式: Slab Allocation

Slab Classes 分配图



Page: 分配给Slab的内存空间，默认是1MB。分配给Slab之后根据slab的大小切分成chunk。

Chunk: 用于缓存记录的内存空间。

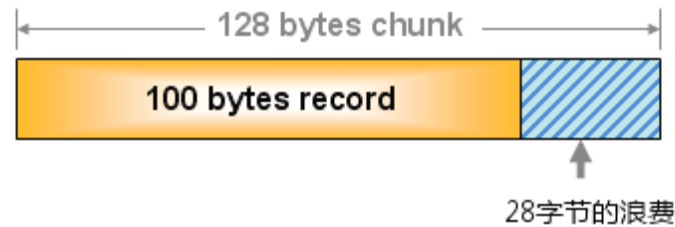
Slab Class: 特定大小的chunk的组。

memcached根据收到的数据的大小，选择最适合数据大小的slab。
memcached中保存着slab内空闲chunk的列表，根据该列表选择chunk，然后将数据缓存于其中。

Memcached介绍:

数据存储方式: Slab Allocation

Slab Allocation 缺点



这个问题就是，由于分配的是特定长度的内存，因此无法有效利用分配的内存。例如，将100字节的数据缓存到128字节的chunk中，剩余的28字节就浪费了。

Memcached介绍:

数据过期方式

- Lazy Expiration

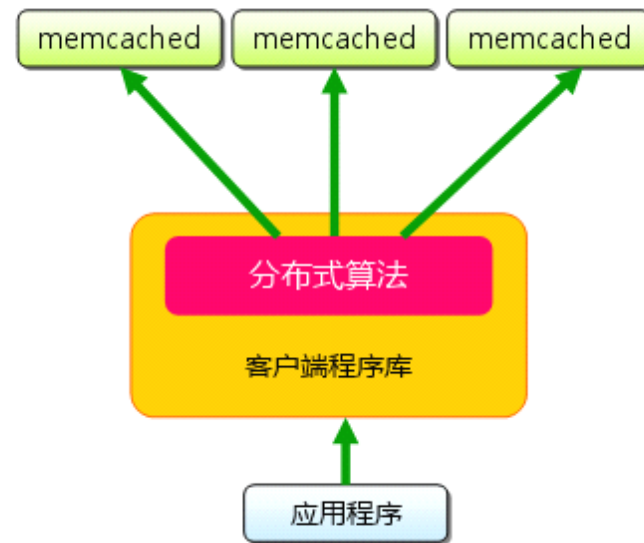
memcached内部不会监视记录是否过期，而是在get时查看记录的时间戳，检查记录是否过期。这种技术被称为lazy（惰性）expiration。因此，memcached不会在过期监视上耗费CPU时间。

- LRU

memcached会优先使用已超时的记录的空间，但即使如此，也会发生追加新记录时空间不足的情况，此时就要使用名为 Least Recently Used (LRU) 机制来分配空间。顾名思义，这是删除“最近最少使用”的记录的机制。因此，当memcached的内存空间不足时（无法从slab class 获取到新的空间时），就从最近未被使用的记录中搜索，并将其空间分配给新的记录。从缓存的实用角度来看，该模型十分理想。

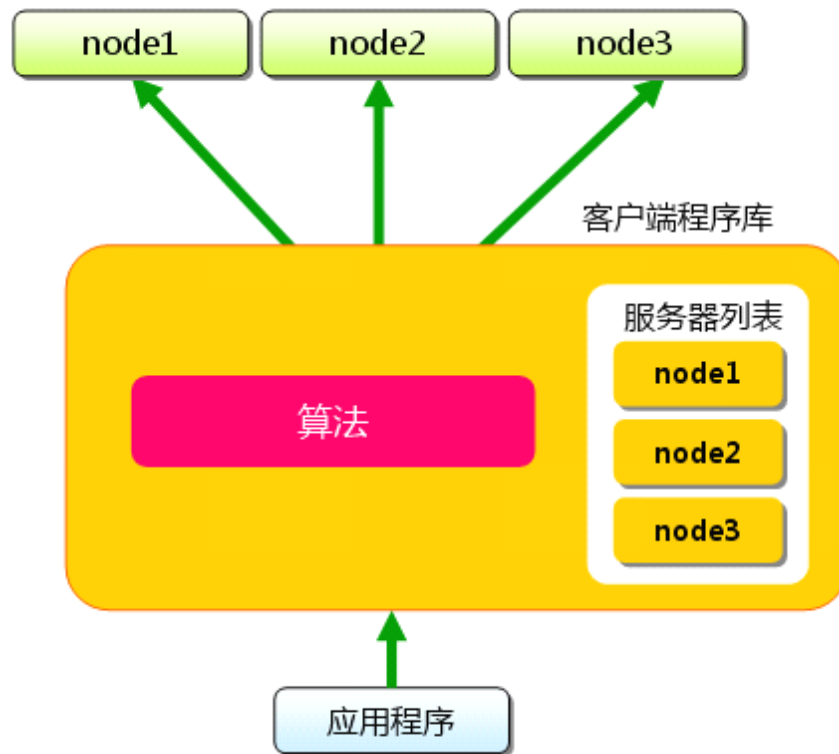
Memcached介绍:

基于客户端的Memcached分布式



Memcached介绍:

基于客户端的Memcached分布式



```
//按照Key值, 获取一个服务器ID
int getServerId(char *key, int serverTotal) {
    int c, hash = 0;
    while (c = *key++) {
        hash += c;
    }
    return hash % serverTotal;
}
```

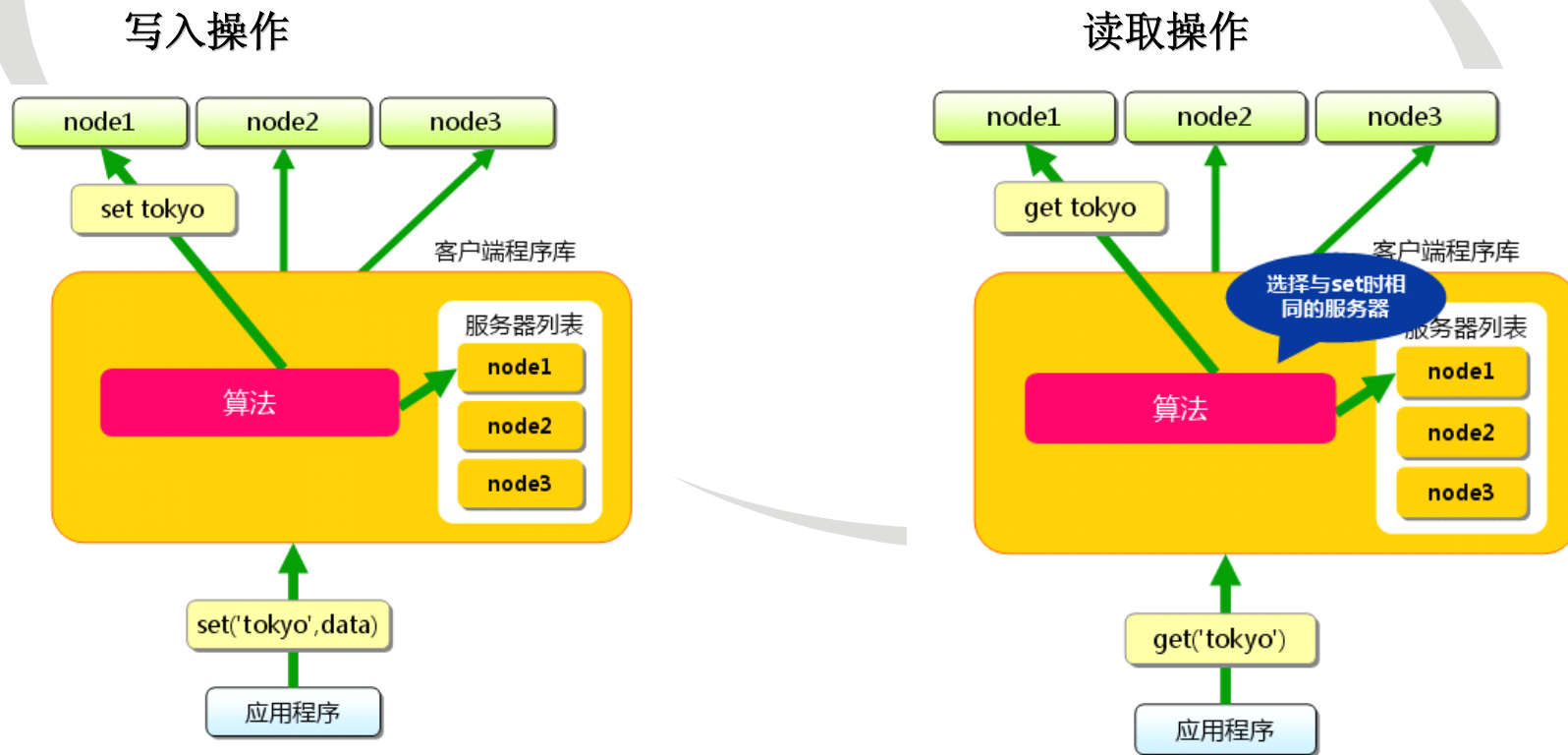
```
//服务器列表
node[0] => 192.168.0.1:11211
node[1] => 192.168.0.2:11211
node[2] => 192.168.0.3:11211
```

```
//获取key是tokyo的节点ID(服务器ID)
int id = getServerId("test", 3);
```

```
//得出的结果是1, 那么对应的机器就是
node[id] == node[1]
```


Memcached介绍:

基于客户端的Memcached分布式



Memcached安装和使用:

- Memcached 安装
- Memcached 与 PHP 结合使用
- Memcached 与 C/C++ 结合使用

Memcached安装和使用:

Memcached 安装

安装步骤:

- 先安装 **libevent**
- 再安装 **Memcached** 主程序

源码下载: (最新版)

libevent官网: <http://monkey.org/~provos/libevent/>

libevent下载: <http://monkey.org/~provos/libevent-1.4.9-stable.tar.gz>

Memcached官网: <http://www.danga.com/memcached>

Memcached下载: <http://www.danga.com/memcached/dist/memcached-1.2.6.tar.gz>

Memcached安装和使用:

Memcached 安装

- 安装 **libevent**

```
# tar zxvf libevent-1.4.9-stable.tar.gz  
# cd libevent-1.4.9-stable  
# ./configure --prefix=/usr  
# make  
# make install
```

- 安装 **Memcached**

```
# tar zxvf memcached-1.2.6.tar.gz  
# cd memcached-1.2.6  
# ./configure --prefix=/usr/local  
# make  
# make install
```

Memcached安装和使用:

Memcached 运行

- 试运行 **Memcached**

/usr/local/bin/memcached -u hualiangxie

```
root@AD_38_220_sles10:~/memcached/memcached-1.2.6# ls -l /usr/lib/libevent*
lrwxrwxrwx 1 root    21 2008-11-20 20:31 /usr/lib/libevent-1.1.so.1 -> libevent-1.1.so.1.0.2*
-rwxrwxrwx 1 root  28588 2006-06-16 21:38 /usr/lib/libevent-1.1.so.1.0.2*
lrwxrwxrwx 1 root    21 2009-01-05 18:53 /usr/lib/libevent-1.4.so.2 -> libevent-1.4.so.2.1.2*
-rwxr-xr-x 1 root 304885 2009-01-05 18:53 /usr/lib/libevent-1.4.so.2.1.2*
-rw-r--r-- 1 root 388506 2009-01-05 18:53 /usr/lib/libevent.a
lrwxrwxrwx 1 root    26 2009-01-05 18:53 /usr/lib/libevent_core-1.4.so.2 -> libevent_core-1.4.so.2.1.2*
-rwxr-xr-x 1 root 109624 2009-01-05 18:53 /usr/lib/libevent_core-1.4.so.2.1.2*
-rw-r--r-- 1 root 147538 2009-01-05 18:53 /usr/lib/libevent_core.a
-rwxr-xr-x 1 root    1009 2009-01-05 18:53 /usr/lib/libevent_core.la*
lrwxrwxrwx 1 root    26 2009-01-05 18:53 /usr/lib/libevent_core.so -> libevent_core-1.4.so.2.1.2*
lrwxrwxrwx 1 root    27 2009-01-05 18:53 /usr/lib/libevent_extra-1.4.so.2 -> libevent_extra-1.4.so.2.1.2*
-rwxr-xr-x 1 root 244351 2009-01-05 18:53 /usr/lib/libevent_extra-1.4.so.2.1.2*
-rw-r--r-- 1 root 302478 2009-01-05 18:53 /usr/lib/libevent_extra.a
-rwxr-xr-x 1 root    1016 2009-01-05 18:53 /usr/lib/libevent_extra.la*
lrwxrwxrwx 1 root    27 2009-01-05 18:53 /usr/lib/libevent_extra.so -> libevent_extra-1.4.so.2.1.2*
-rwxr-xr-x 1 root    974 2009-01-05 18:53 /usr/lib/libevent.la*
lrwxrwxrwx 1 root    21 2009-01-05 18:53 /usr/lib/libevent.so -> libevent-1.4.so.2.1.2*
root@AD_38_220_sles10:~/memcached/memcached-1.2.6# ls -l /usr/local/bin/memcached*
-rwxr-xr-x 1 root 123871 2009-01-05 18:55 /usr/local/bin/memcached*
-rwxr-xr-x 1 root 132288 2009-01-05 18:55 /usr/local/bin/memcached-debug*
root@AD_38_220_sles10:~/memcached/memcached-1.2.6# /usr/local/bin/memcached -u hualiangxie
```

Memcached安装和使用:

Memcached 运行

查看**Memcached** 帮助信息

```
# /usr/local/bin/memcached -h
```

```
root@AD_38_220_sles10:~/memcached/memcached-1.2.6# /usr/local/bin/memcached -h
memcached 1.2.6
-p <num>      TCP port number to listen on (default: 11211)
-U <num>      UDP port number to listen on (default: 0, off)
-s <file>     unix socket path to listen on (disables network support)
-a <mask>     access mask for unix socket, in octal (default 0700)
-l <ip_addr>  interface to listen on, default is INADDR_ANY
-d           run as a daemon
-r           maximize core file limit
-u <username> assume identity of <username> (only when run as root)
-m <num>     max memory to use for items in megabytes, default is 64 MB
-M           return error on memory exhausted (rather than removing items)
-c <num>     max simultaneous connections, default is 1024
-k           lock down all paged memory. Note that there is a
             limit on how much memory you may lock. Trying to
             allocate more than that would fail, so be sure you
             set the limit correctly for the user you started
             the daemon with (not for -u <username> user;
             under sh this is done with 'ulimit -S -l NUM_KB').
-v           verbose (print errors/warnings while in event loop)
-vv          very verbose (also print client commands/reponses)
-h           print this help and exit
-i           print memcached and libevent license
-b           run a managed instanced (mnemonic: buckets)
-P <file>    save PID in <file>, only used with -d option
-f <factor>  chunk size growth factor, default 1.25
-n <bytes>   minimum space allocated for key+value+flags, default 48
root@AD_38_220_sles10:~/memcached/memcached-1.2.6#
```

Memcached安装和使用:

Memcached 运行

关注基本选项

-p <num>	监听的TCP端口 (缺省: 11211)
-d	以守护进程方式运行Memcached
-u <username>	运行Memcached的账户, 非root用户
-m <num>	最大的内存使用, 单位是MB, 缺省是 64 MB
-c <num>	软连接数量, 缺省是 1024
-v	输出警告和错误信息
-vv	打印客户端的请求和返回信息
-h	打印帮助信息
-i	打印memcached和libevent的版权信息

运行 Memcached

目标: 使用11211端口、hualiangxie用户、最大占用512M内存、1024个软连接, 输出客户端请求, 以守护进程方式运行

```
# /usr/local/bin/memcached -p 11211 -d -u hualiangxie -m 512 -c 1024 -vvv
```

Memcached安装和使用:

Memcached 运行

检查是否正常启动

```
# ps auxxww | grep memcached
```

```
1001    4402  0.0  0.0  2296  900 pts/0    S+  19:24   0:00 /usr/local/bin/memcached -u hualiangxie
root    4547  0.0  0.0  1892  668 pts/3    S+  19:42   0:00 grep memcached
```

```
# telnet localhost 11211
```

Trying 127.0.0.1...

Connected to localhost.

Escape character is '^['.

stats

STAT pid 4402

STAT uptime 1032

STAT time 1231155683

STAT version 1.2.6

STAT pointer_size 32

...

END

```
root@AD_38_220_sles10:~/php/memcache-2.2.4# ps auxxww | grep memcached
1001    4402  0.0  0.0  4344  2956 pts/0    S+  19:24   0:00 /usr/local/bin/memcached -u hualiangxie
root    9157  0.0  0.0  1888   664 pts/1    S+  21:08   0:00 grep memcached
root@AD_38_220_sles10:~/php/memcache-2.2.4# telnet localhost 11211
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^['.
stats
STAT pid 4402
STAT uptime 6294
STAT time 1231160945
STAT version 1.2.6
STAT pointer_size 32
STAT rusage_user 0.000000
STAT rusage_system 0.000000
STAT curr_items 0
STAT total_items 20
STAT bytes 0
STAT curr_connections 2
STAT total_connections 12
STAT connection_structures 3
STAT cmd_get 31
STAT cmd_set 23
STAT get_hits 21
STAT get_misses 10
STAT evictions 0
STAT bytes_read 1550
STAT bytes_written 1837
STAT limit_maxbytes 67108864
STAT threads 1
END
```


Memcached安装和使用:

Memcached 基本协议

数据存取

set key1 0 180 3

abc

STORED

add key1 0 180 3

xyz

NOT_STORED

get key1

VALUE key1 0 3

abc

END

replace key1 0 180 3

xyz

STORED

get key1

VALUE key1 0 3

xyz

END

delete key1

DELETED

数字加减

set key2 0 180 4

1234

STORED

incr key2 3

1237

get key2

VALUE key2 0 4

1237

END

decr key2 1

1236

get key2

VALUE key2 0 4

1236

END

```
root@AD_38_220_sles10:~# telnet localhost 11211
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.
• set key1 0 180 3
abc
STORED
• add key1 0 180 3
xyz
NOT_STORED
• get key1
VALUE key1 0 3
abc
END
• replace key1 0 180 3
xyz
STORED
• get key1
VALUE key1 0 3
xyz
END
• delete key1
DELETED
• set key2 0 180 4
1234
STORED
• incr key2 3
1237
• get key2
VALUE key2 0 4
1237
END
• decr key2 1
1236
• get key2
VALUE key2 0 4
1236
END
quit
Connection closed by foreign host.
```

Memcached安装和使用:

Memcached 和 PHP 结合使用

安装 **PHP Memcache** 扩展

扩展官网: <http://pecl.php.net/package/memcache>

扩展下载: <http://pecl.php.net/get/memcache-2.2.4.tgz>

Memcache扩展安装:

```
# tar zxvf memcache-2.2.4.tgz
# cd memcache-2.2.4
# /usr/local/php/bin/phpize
# ./configure --with-php-config=/usr/local/php/bin/php-config
# make
# make install
```

配置

```
# ls -l /usr/local/php/lib/php/extensions/no-debug-non-zts-20060613/memcache.so
# vim /usr/local/php/lib/php.ini
新增配置内容:
extension_dir = "/usr/local/php/lib/php/extensions/no-debug-non-zts-20060613/"
extension = memcache.so
```

检查安装结果

```
# /usr/local/php/bin/php -m
# /usr/local/apache2/bin/apachectl restart
```

```
648 ;extension=php_xmlrpc.dll
649 ;extension=php_xsl.dll
650 ;extension=php_zip.dll
651
652 extension = memcache.so
653
654
655 ;extension = uploadprogress.so
656 ;extension = example.so
657
```

Memcached安装和使用:

Memcached 与 PHP 结合使用

PHP与Memcache结合测试代码

```
<?php
//连接Memcache
$mem = new Memcache;
$mem->connect("localhost", 11211);

//保存数据
$mem->set('key1', 'This is first value', 0, 60);
$val = $mem->get('key1');
echo "Get key1 value: " . $val . "<br>";

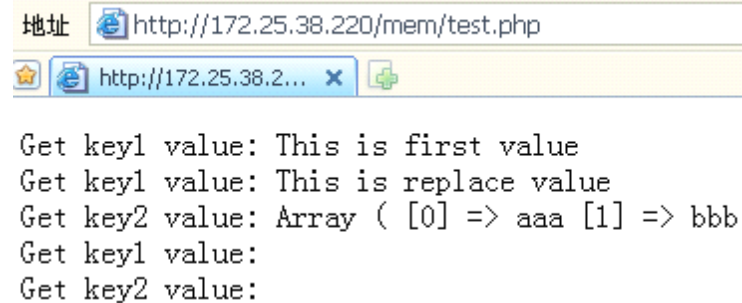
//替换数据
$mem->replace('key1', 'This is replace value', 0, 60);
$val = $mem->get('key1');
echo "Get key1 value: " . $val . "<br>";

//保存数组数据
$arr = array('aaa', 'bbb', 'ccc', 'ddd');
$mem->set('key2', $arr, 0, 60);
$val2 = $mem->get('key2');
echo "Get key2 value: ";
print_r($val2);
echo "<br>";
```

```
//删除数据
$mem->delete('key1');
$val = $mem->get('key1');
echo "Get key1 value: " . $val . "<br>";
```

```
//清除所有数据
$mem->flush();
$val2 = $mem->get('key2');
echo "Get key2 value: ";
print_r($val2);
echo "<br>";
```

```
//关闭连接
$mem->close();
?>
```



```
地址 http://172.25.38.220/mem/test.php
http://172.25.38.2... x
Get key1 value: This is first value
Get key1 value: This is replace value
Get key2 value: Array ( [0] => aaa [1] => bbb
Get key1 value:
Get key2 value:
```

Memcached安装和使用:

Memcached 与 PHP 结合使用

PHP与Memcache分布式

在一台或者多台机器启用一个或者多个进程，这里是在一台机器启用两个进程，使用两个端口：

```
# /usr/local/bin/memcached -p 11211 -d -u hualiangxie  
# /usr/local/bin/memcached -p 11212 -d -u hualiangxie
```

PHP 测试代码

```
<?php
```

```
//连接Memcache
```

```
$mem = new Memcache;
```

```
$mem->addServer("localhost", 11211);
```

```
$mem->addServer("localhost", 11212);
```

```
//保存数据
```

```
$mem->set('key1', 'This is first value', 0, 60);
```

```
$val = $mem->get('key1');
```

```
echo "Get key1 value: " . $val . "<br>";
```

```
//保存数组数据
```

```
$arr = array('aaa', 'bbb', 'ccc', 'ddd');
```

```
$mem->set('key2', $arr, 0, 60);
```

```
$val2 = $mem->get('key2');
```

```
echo "Get key2 value: ";
```

```
print_r($val2);
```

```
echo "<br>";
```

```
//删除数据
```

```
$mem->delete('key1');
```

```
$val = $mem->get('key1');
```

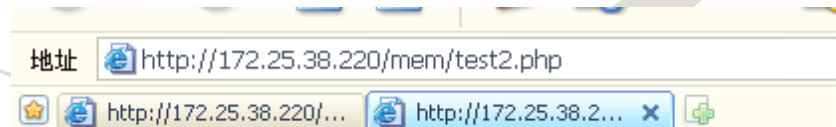
```
echo "Get key1 value: " . $val . "<br>";
```

```
//关闭连接
```

```
$mem->close();
```

```
?>
```

注意：实际上Key1保存在11211端口机器，
Key2保存在11212端口机器上



```
Get key1 value: This is first value
```

```
Get key1 value: This is replace value
```

```
Get key2 value: Array ( [0] => aaa [1] => bbb [2] => )
```

```
Get key1 value:
```

Memcached安装和使用:

Memcached 和 C/C++ 结合使用

安装 **C/C++ Memcached** 客户端库: **libmemcached**

开发库官网: <http://tangent.org/552/libmemcached.html>

开发库下载: <http://download.tangent.org/libmemcached-0.25.tar.gz>

libmemcached库安装:

```
# tar zxvf libmemcached-0.25.tar.gz
# cd libmemcached-0.25
# ./configure --prefix=/usr
# make
# make install
```

检查安装结果

```
# ls /usr/lib/libmemcache*      //库文件
# ls /usr/include/libmemcached/* //头文件
# ls /usr/bin/mem*             //命令行工具
```

参考 **libmenmcached** 开发示例代码

```
# man libmemcached_examples
```

Memcached安装和使用:

Memcached 与 C/C++ 结合使用

C/C++与Memcached结合测试代码

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <libmemcached/memcached.h>
```

```
int main(int argc, char *argv[]) {
    memcached_st *memc;
    memcached_return rc;
    memcached_server_st *servers;
    char value[8191];

    //connect server
    memc = memcached_create(NULL);
    servers = memcached_server_list_append(NULL, "localhost",
    11211, &rc);
    rc = memcached_server_push(memc, servers);
    memcached_server_free(servers);

    //Save data
    strcpy(value, "This is c first value");
    rc = memcached_set(memc, "key1", 4, value, strlen(value),
    (time_t)180, (uint32_t)0);
    if (rc == MEMCACHED_SUCCESS) {
        printf("Save key:key1 data: \"%s\" success.\n", value);
    }
}
```

```
//Fetch data
char return_key[MEMCACHED_MAX_KEY];
size_t return_key_length;
char *return_value;
size_t return_value_length;

char *keys[] = {"key1"};
size_t key_length[] = {4};
uint32_t flags;

rc = memcached_mget(memc, keys, key_length, 1);
return_value = memcached_fetch(memc, return_key,
&return_key_length, &return_value_length, &flags, &rc);
if (rc == MEMCACHED_SUCCESS) {
    printf("Fetch key:%s data:%s\n", return_key, return_value);
}

//Delete data
rc = memcached_delete(memc, "key1", 4, (time_t)0);
if (rc == MEMCACHED_SUCCESS) {
    printf("Delete Key key1 success.\n");
}

//free
memcached_free(memc);
return 0;
}
```

Memcached安装和使用:

Memcached 与 C/C++ 结合使用

C/C++与Memcached结合测试结果

编译执行以上代码:

```
# gcc -o c_test1 c_test1.c -lmemcached  
# ./c_test1
```

输出结果:

```
Save key:key1 data:"This is c first value" success.  
Fetch key:key1 data:This is c first value  
Delete Key key1 success.
```

```
root@AD_38_220_sles10:/home/hualiangxie/www/adms/view/mem# gcc -o c_test1 c_test1.c -lmemcached  
root@AD_38_220_sles10:/home/hualiangxie/www/adms/view/mem# ./c_test1  
Save key:key1 data:"This is c first value" success.  
Fetch key:key1 data:This is c first value  
Delete Key key1 success.  
root@AD_38_220_sles10:/home/hualiangxie/www/adms/view/mem# |
```

Memcached安装和使用:

Memcached 与 C/C++ 结合使用

C/C++与Memcached分布式结合测试代码1

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <libmemcached/memcached.h>
```

```
int main(int argc, char *argv[]) {
    memcached_st *memc;
    memcached_return rc;
    memcached_server_st *servers;
    char value[8191];
```

```
//connect multi server
memc = memcached_create(NULL);
servers = memcached_server_list_append(NULL, "localhost", 11211, &rc);
servers = memcached_server_list_append(servers, "localhost", 11212, &rc);
rc = memcached_server_push(memc, servers);
memcached_server_free(servers);
```

```
//Save multi data
size_t i;
char *keys[] = {"key1", "key2", "key3"};
size_t key_length[] = {4, 4, 4};
char *values[] = {"This is c first value", "This is c
second value", "This is c third value"};
size_t val_length[] = {21, 22, 21};

for (i=0; i <3; i++) {
    rc = memcached_set(memc, keys[i],
key_length[i], values[i], val_length[i], (time_t)180,
(uint32_t)0);
    if (rc == MEMCACHED_SUCCESS) {
        printf("Save key:%s data:\"%s\" success.\n",
keys[i], values[i]);
    }
}
```


Memcached安装和使用:

Memcached 与 C/C++ 结合使用

C/C++与Memcached分布式结合测试代码2

```
//Fetch multi data
char return_key[MEMCACHED_MAX_KEY];
size_t return_key_length;
char *return_value;
size_t return_value_length;
uint32_t flags;

rc = memcached_mget(memc, keys, key_length, 3);
while ((return_value = memcached_fetch(memc, return_key,
&return_key_length, &return_value_length, &flags, &rc))) {
    if (rc == MEMCACHED_SUCCESS) {
        printf("Fetch key:%s data:%s\n", return_key, return_value);
    }
}
```

```
//Delete multi data
for (i=0; i < 3; i++) {
    rc = memcached_set(memc, keys[i], key_length[i],
values[i], val_length[i], (time_t)180, (uint32_t)0);
    rc = memcached_delete(memc, keys[i],
key_length[i], (time_t)0);
    if (rc == MEMCACHED_SUCCESS) {
        printf("Delete %s success\n", keys[i], values[i]);
    }
}

//free
memcached_free(memc);

return 0;
}
```

Memcached安装和使用:

Memcached 与 C/C++ 结合使用

C/C++与Memcached分布式结合测试结果

编译执行以上代码:

```
# gcc -o c_test2 c_test2.c -lmemcached  
# ./c_test2
```

输出结果:

```
Save key:key1 data:"This is c first value" success.  
Save key:key2 data:"This is c second value" success.  
Save key:key3 data:"This is c third value" success.  
Fetch key:key1 data:This is c first value  
Fetch key:key2 data:This is c second value  
Fetch key:key3 data:This is c third value  
Delete key1 success  
Delete key2 success  
Delete key3 success
```

```
root@AD_38_220_sles10:/home/hualiangxie/www/adms/view/mem# gcc -o c_test2 c_test2.c -lmemcached  
root@AD_38_220_sles10:/home/hualiangxie/www/adms/view/mem# ./c_test2  
Save key:key1 data:"This is c first value" success.  
Save key:key2 data:"This is c second value" success.  
Save key:key3 data:"This is c third value" success.  
Fetch key:key1 data:This is c first value  
Fetch key:key2 data:This is c second value  
Fetch key:key3 data:This is c third value  
Delete key1 success  
Delete key2 success  
Delete key3 success  
root@AD_38_220_sles10:/home/hualiangxie/www/adms/view/mem# |
```

一些经验和技巧:

Memcached一些特性和限制

- 在 Memcached 中可以保存的item数据量是没有限制的，只有内存足够
- Memcached单进程最大使用内存为2G，要使用更多内存，可以分多个端口开启多个Memcached进程
- 最大30天的数据过期时间, 设置为永久的也会在这个时间过期，常量REALTIME_MAXDELTA 60*60*24*30 控制
- 最大键长为250字节，大于该长度无法存储，常量KEY_MAX_LENGTH 250 控制
- 单个item最大数据是1MB，超过1MB数据不予存储，常量POWER_BLOCK 1048576 进行控制，它是默认的slab大小
- 最大同时连接数是200，通过 conn_init()中的freetotal 进行控制，最大软连接数是1024，通过 settings.maxconns=1024 进行控制
- 跟空间占用相关的参数： settings.factor=1.25, settings.chunk_size=48, 影响slab的数据占用和步进方式

一些经验和技巧:

查看Memcached内部工作状态

访问Memcached: telnet 主机名 端口号

查看总状态: stats

查看某项状态: stats curr_connections

禁止LRU

有些情况下LRU机制反倒会造成麻烦。memcached启动时通过“-M”参数可以禁止LRU，如下所示：

```
$ memcached -M -m 1024
```

启动时必须注意的是，小写的“-m”选项是用来指定最大内存大小的。不指定具体数值则使用默认值64MB。

指定“-M”参数启动后，内存用尽时memcached会返回错误。话说回来，memcached毕竟不是存储器，而是缓存，所以推荐使用LRU。

一些经验和技巧:

Memcached使用线程模式工作

在安装的时候必须打开: `./configure --enable-threads`

安装完之后, 启动的时候看看帮助信息有没有这条:

`-t <num>` number of threads to use, default 4

如果存在该选项, 说明已经支持了线程, 就可以在启动的时候使用 `-t` 选项来启动多线程

然后启动的时候必须加上你需要支持的线程数量:

`/usr/local/memcache/bin/memcached -t 1024`

一些经验和技巧:

调优Slab和内存分配1

memcached在启动时指定 **Growth Factor**因子（通过**-f**选项），就可以在某种程度上控制**slab**之间的差异。默认值为**1.25**。但是，在该选项出现之前，这个因子曾经固定为**2**，称为“**powers of 2**”策略。让我们用以前的设置，以**verbose**模式启动memcached试试看：

```
$ memcached -f 2 -vv
```

```
slab class 1: chunk size 128 perslab 8192
slab class 2: chunk size 256 perslab 4096
slab class 3: chunk size 512 perslab 2048
slab class 4: chunk size 1024 perslab 1024
slab class 5: chunk size 2048 perslab 512
slab class 6: chunk size 4096 perslab 256
slab class 7: chunk size 8192 perslab 128
slab class 8: chunk size 16384 perslab 64
slab class 9: chunk size 32768 perslab 32
slab class 10: chunk size 65536 perslab 16
slab class 11: chunk size 131072 perslab 8
slab class 12: chunk size 262144 perslab 4
slab class 13: chunk size 524288 perslab 2
```

一些经验和技巧:

调优Slab和内存分配2

可见，从128字节的组开始，组的大小依次增大为原来的2倍。这样设置的问题是，slab之间的差别比较大，有些情况下就相当浪费内存。因此，为尽量减少内存浪费，两年前追加了growth factor这个选项。来看看现在的默认设置（f=1.25）时的输出（篇幅所限，这里只写到第10组）：

```
slab class 1: chunk size 88 perslab 11915
slab class 2: chunk size 112 perslab 9362
slab class 3: chunk size 144 perslab 7281
slab class 4: chunk size 184 perslab 5698
slab class 5: chunk size 232 perslab 4519
slab class 6: chunk size 296 perslab 3542
slab class 7: chunk size 376 perslab 2788
slab class 8: chunk size 472 perslab 2221
slab class 9: chunk size 592 perslab 1771
slab class 10: chunk size 744 perslab 1409
```

可见，组间差距比因子为2时小得多，更适合缓存几百字节的记录。从上面的输出结果来看，可能会觉得有些计算误差，这些误差是为了保持字节数的对齐而故意设置的。

将memcached引入产品，或是直接使用默认值进行部署时，最好是重新计算一下数据的预期平均长度，调整growth factor，以获得最恰当的设置。内存是珍贵的资源，浪费就太可惜了。

一些经验和技巧:

参考文档和延伸阅读

以下为本PPT参考文档，特别是参考了mixi.jp 公司编写的《Memcached全面剖析》

Memcached全面剖析: <http://tech.idv2.com/2008/08/17/memcached-pdf/>

Memcached 1.2 内存模型分析: <http://phpcup.cn/viewthread.php?tid=45>

Memcached深度分析: <http://funjackyone.javaeye.com/blog/128384>

memcached server LRU 深入分析: <http://www.javaeye.com/topic/225692>

Memcache使用详解: <http://blog.csdn.net/heiyeshuwu/archive/2006/11/13/1380838.aspx>