

Das Lern-Management System (LMS) StudIP an der Universität Osnabrück

**Installation und Konfiguration,
Monitoring und Benchmarking**

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- Hardware
- Betriebssystem
- Datenbank (MySQL) –Installation/Konfiguration
- Web Server (Apache) und Skriptsprache PHP - Installation/Konfiguration
- eLearning StudIP - Installation/Konfiguration
- MySQL - Monitoring
- Apache - Monitoring
- Globales Monitoring
- Benchmarking
- Ausblick

Datenbank-Server

Dell PowerEdge 2xxx

cat /proc/cpuinfo

```
processor      : 0 (of 0,1,2,3)
model name    : Intel(R) Xeon(TM) CPU 2.40GHz
cache size   : 512 KB
```

cat /proc/meminfo

```
MemTotal:    3082448 kB (3 GB)
```

Web-Server

Dell PowerEdge 2xxx

cat /proc/cpuinfo

```
processor      : 0 (von 0,1,2,3)
model name    : Intel(R) Xeon(TM) CPU 2.80GHz
cache size   : 512 KB
```

cat /proc/meminfo

```
MemTotal:    2055400 kB (2 GB)
```

RedHat Enterprise Linux

```
# cat /etc/redhat-release
```

```
Red Hat Enterprise Linux AS release 3  
(Taroon Update 3)
```

```
# uname -a
```

```
Linux <xxx>.rz.uni-osnabrueck.de  
2.4.21-20.0.1.ELsmp #1 SMP Wed Nov 24 20:34:01  
EST 2004 i686 i686 i386 GNU/Linux
```

MySQL RPM Pakete von <http://www.mysql.org>

```
# rpm -qa | grep MySQL
```

```
MySQL-server-4.0.21-0
```

```
MySQL-client-4.0.21-0
```

```
MySQL-Max-4.0.21-0
```

```
# /usr/sbin/mysqld-max -v
```

```
/usr/sbin/mysqld-max Ver 4.0.21-Max for pc-linux on  
i686 (Official MySQL RPM)
```

Dateisystem auf eigener RAID5-Platte

MySQL Systemvariablen

```
# cat /etc/my.cnf
```

```
[mysqld]
```

```
# Store database files on own disk.
```

```
datadir=/database/studip
```

```
# Disable INNODB.
```

```
skip-innodb
```

```
# Disable locking.
```

```
skip-locking
```

```
# Set max. number of connections.
```

```
# Set to httpd.conf: MaxClients + Overhead
```

```
max_connections=300
```

...(continued)

Set global key buffer for MyISAM indexes.

This is the MOST important system variable.

Use 1/4 of available RAM or more.

key_buffer = 512M

Set global number for max. open tables.

Should be 2 x max_connections or more.

table_cache = 700

Apache RPM Pakete über RedHat up2date

```
# rpm -qa | grep httpd  
redhat-config-httpd-1.1.0-4  
httpd-2.0.46-44.ent
```

```
# /usr/sbin/httpd -V  
Server version: Apache/2.0.46  
Server compiled with ....  
-D APACHE_MPM_DIR="server/mpm/prefork"  
...(more)...
```

Dateisystem auf eigener RAID5-Platte

```
# cat /etc/httpd/conf/httpd.conf
```

```
ServerLimit 500
```

```
<IfModule prefork.c>
```

```
    StartServers      8
```

```
    MaxClients       250
```

```
    ...
```

```
</IfModule>
```

```
...(more) ...
```

PHP als Apache Modul

```
# cat /etc/httpd/conf.d/php.conf
```

...

PHP Konfiguration

```
# cat /etc/php.ini
```

...

Spezielle PHP Konfiguration für StudIP

```
# cat /etc/httpd/conf.d/studip.conf
```

...

StudIP für Universität Osnabrück

- aktuell: Versionsnummer: Stud.IP 1.1-OS-3;
Download aus Subversion (SVN)
- ab 2006: Umstieg auf offizielles StudIP Release

Branches für:

- StudIP HTML-Seiten und PHP Skripte
- StudIP PHP Library

```
# cat studip-phplib/local.inc
```

```
...
```





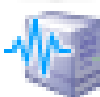




Upload von Dateien:

MaxFileSize: 20 MB

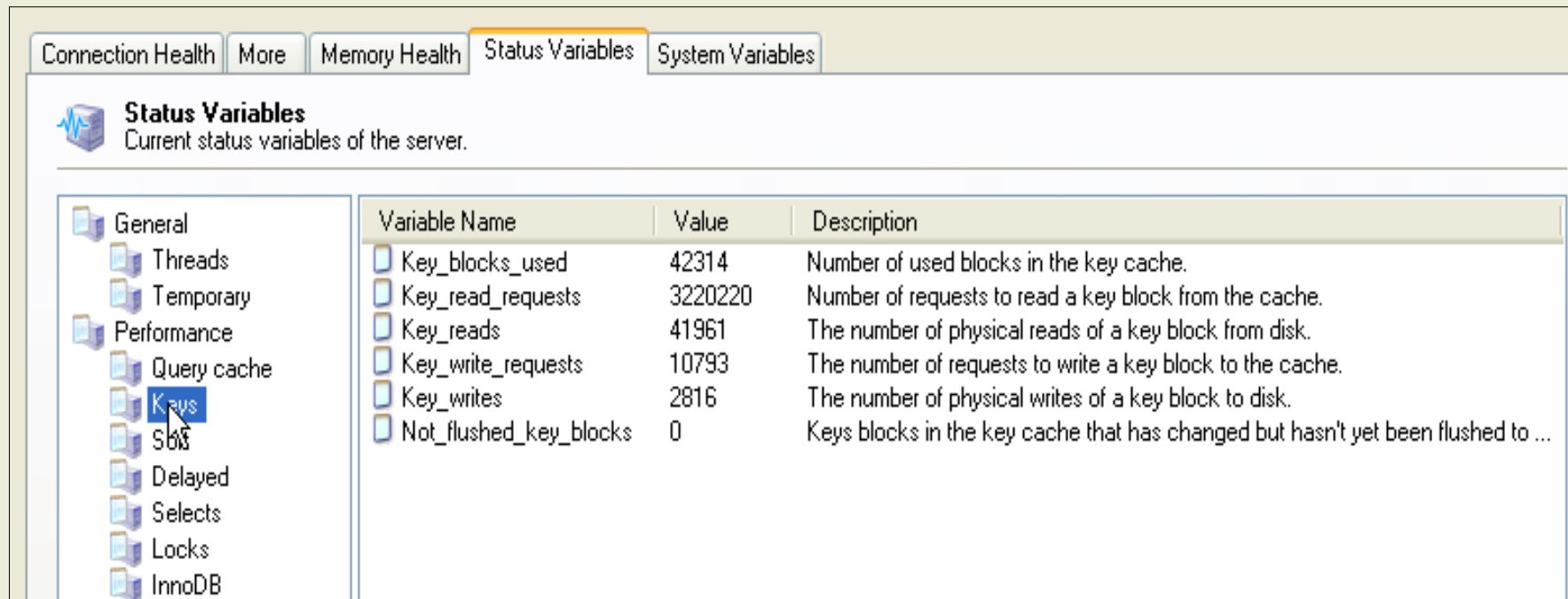
ForbiddenFileTypes: *.exe, *.pif, ...

MySQL Administrator

(Download: www.mysql.org)

-  Server Information
-  Service Control
-  Startup Variables
-  User Administration
-  Server Connections
-  Health
-  Server Logs
-  Replication Status
-  Backup
-  Restore
-  Catalogs

MySQL Administrator > Health > Status Variables



The screenshot shows the MySQL Administrator interface with the 'Status Variables' tab selected. The window title is 'Status Variables' and the subtitle is 'Current status variables of the server.' The left sidebar shows a tree view with categories: General, Threads, Temporary, Performance, Query cache, Keys (selected), Socks, Delayed, Selects, Locks, and InnoDB. The main area displays a table of variables.

Variable Name	Value	Description
Key_blocks_used	42314	Number of used blocks in the key cache.
Key_read_requests	3220220	Number of requests to read a key block from the cache.
Key_reads	41961	The number of physical reads of a key block from disk.
Key_write_requests	10793	The number of requests to write a key block to the cache.
Key_writes	2816	The number of physical writes of a key block to disk.
Not_flushed_key_blocks	0	Keys blocks in the key cache that has changed but hasn't yet been flushed to ...

MySQL Administrator > Health > Memory Health



Memory Health

Gives an overview of critical memory health issues.

Query Cache Hitrate



Hitrate 66 %

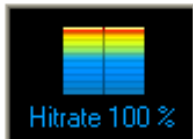


Current: 66 | Min: 0 | Max: 100 | Avg: 26

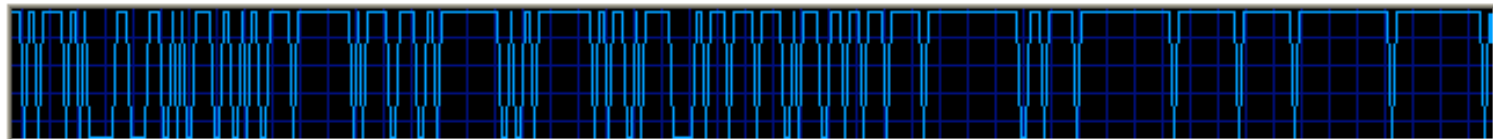
Key Efficiency

Key buffer usage 510.730.240

Key buffer 536.870.912



Hitrate 100 %



Current: 100 | Min: 0 | Max: 100 | Avg: 44

MySQL Administrator Beispiel: Key Buffer Usage

Key buffer usage 44.659.712

Key buffer 536.870.912

Formel:

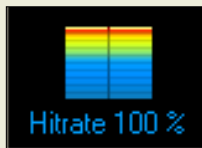
Value: $[\text{Key_blocks_used}] * [\text{key_cache_block_size}]$

Max: $[\text{key_buffer_size}]$

Erläuterung:

In Formeln können alle Status- und System-Variablen verwendet werden.

MySQL Administrator Beispiel: Key Buffer Hitrate



Formel:

Value:

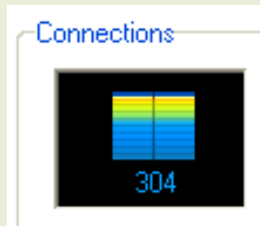
$$100 - \left(\frac{\text{Key_reads}}{\text{Key_read_requests}} \right) * 100$$

Erläuterung:

Möglichst: $\text{key_read_requests} / \text{key_reads} > 1000$

Anderfalls ist `key_buffer_size` zu klein.

MySQL Administrator Selbst definiertes Beispiel: Connections



$$(350 - 46 = 304)$$

Formel:

Value:

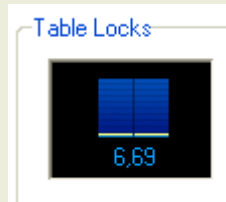
`[max_connections] - [Threads_connected]`

Erläuterung:

Möglichst genügend freie Verbindungen.

MySQL Administrator

Selbst definiertes Beispiel: Table Locks



Formel:

Value:

$$\frac{[10000 * [Table_Locks_Waited]]}{([Table_Locks_Immediate] + 1)}$$

Erläuterung:

Möglichst keine Waits. 10000 zu 1 okay.

MySQL Administrator

Weitere interessante Konstellationen von Status- und System-Variablen:

- Table_cache, Open_table, opened_tables
- Qcache_hits, QCache_inserts, [QCache_not_cached
- ... ???

MySQL Slow Query Logging

Aktivieren in MySQL Konfigurationsdatei

```
# cat /etc/my.cnf
```

```
# Set time in seconds that makes up a long query.
```

```
long_query_time=5
```

```
# Set log file name.
```

```
log-slow-queries = /var/log/mysql/slow_queries.log
```

MySQL Slow Query Logging

Analysieren der Slow Query Log Datei

```
# mysqldumpslow -v -t=20 -s=at \  
/var/log/mysql/slow_queries.log | less
```

Reading mysql slow query log from

/var/log/mysql/slow_queries.log

Count: 5 Time=3.00s (15s) Lock=0.00s (0s) Rows=17921.8

(89609), root[root]@localhost

```
SELECT /*!N SQL_NO_CACHE */ * FROM `active_sessions`
```

...(more)...

Systemauslastung

Kontrollieren von Memory und Swap Usage, I/O-Wait etc.

top

```
15:49:49 up 22 days, 7:27, 3 users, load average: 0,23, 0,19, 0,11
98 processes: 97 sleeping, 1 running, 0 zombie, 0 stopped
CPU states:  cpu    user    nice    system    irq    softirq  iowait    idle
              total    9,2%    0,0%    0,8%    0,0%    0,8%    0,4%    388,0%
              cpu00    0,2%    0,0%    0,0%    0,0%    0,0%    0,2%    99,6%
              cpu01    5,0%    0,0%    0,2%    0,0%    1,0%    0,2%    93,6%
              cpu02    3,6%    0,0%    0,6%    0,0%    0,0%    0,0%    95,8%
              cpu03    0,6%    0,0%    0,0%    0,0%    0,0%    0,0%    99,3%
Mem:  2055400k av, 1472160k used,  583240k free,      0k shrd, 121072k buff
      982584k actv, 227620k in_d, 32496k in_c
Swap: 2096440k av,  33348k used, 2063092k free      966408k cached

  PID USER   PRI  NI  SIZE  RSS  SHARE STAT  %CPU  %MEM  TIME CPU COMMAND
 20822 root    15   0 10300 9604  7052 S    10,0  0,4   2:50  2 httpd
```

Aktivieren von server-status (analog: server-info)

```
# cat /etc/httpd/conf/httpd.conf
```

```
# ExtendedStatus controls whether Apache will generate "full"  
# status) or just basic information.
```

```
ExtendedStatus On
```

```
<Location /server-status>
```

```
    SetHandler server-status
```

```
    Order deny,allow
```

```
    Deny from all
```

```
    Allow from <myhost.mydomain>
```

```
</Location>
```

Server-Staus über Rechner myhost.mydomain

<https://studip.serv.uni-osnabrueck.de/server-status>

Apache Server Status for studip.serv.uni-osnabrueck.de

Server Version: Apache/2.0.46 (Red Hat) mod_perl/1.99_09 Perl/v5.8.0 DAV/2 PHP/4.3.9 mod_python/3.0.3 Python/2.2.3
mod_ssl/2.0.46 OpenSSL/0.9.7a
Server Built: Nov 5 2004 10:58:21

Current Time: Wednesday, 21-Sep-2005 16:55:25 CEST
Restart Time: Wednesday, 21-Sep-2005 16:51:51 CEST
Parent Server Generation: 0
Server uptime: 3 minutes 33 seconds
Total accesses: 1058 - Total Traffic: 10.1 MB
CPU Usage: u25.83 s1.82 cu.03 cs0 - 13% CPU load
4.97 requests/sec - 48.6 kB/second - 9.8 kB/request
1 requests currently being processed, 17 idle workers

httperf (oder Apache Benchmark [ab], ...)

```
# /bin/httperf --port 80 --timeout 1 \  
  --num-conns 100 --rate 10 \  
  --server studip.serv.uni-osnabrueck.de
```

Reply rate [replies/s]: min 10.0 avg 10.0 max 10.0 stddev 0.0 (1 samples)

Reply time [ms]: response 26.5 transfer 0.1

Reply size [B]: header 568.0 content 1641.0 footer 0.0 (total 2209.0)

Reply status: 1xx=0 2xx=100 3xx=0 4xx=0 5xx=0

...(more)...

Hobbit / BigBrother

```
# ps | grep /opt/bb
```

```
/opt/bb/bin/bbrun -a /opt/bb/ext/bb-memory.sh  
# collects memory usage info
```

```
/opt/bb/bin/bbrun -a /opt/bb/ext/netstat-bf.sh  
# collects network usage info
```

Hobbit / BigBrother

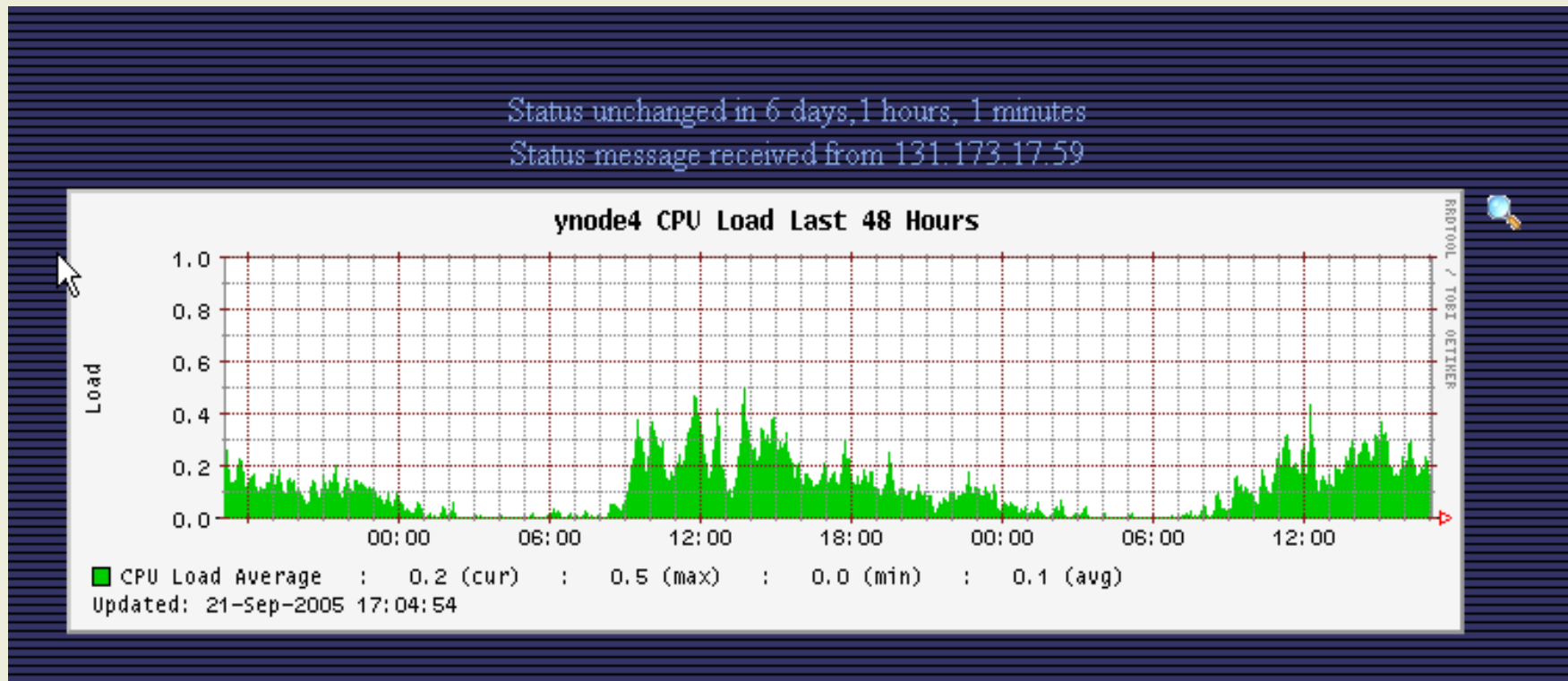
Grafische Anzeige per WebBrowser

StudIP Servers

	<u>conn</u>	<u>cpu</u>	<u>disk</u>	<u>http</u>	<u>info</u>	<u>memory</u>	<u>msgs</u>	<u>ntp</u>	<u>procs</u>	<u>ssh</u>	<u>sslcert</u>	<u>trends</u>	<u>tsm</u>	<u>vmio</u>
sanode4 (studip.uni.sync)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	-	◆	-	◆
sanode9 (studip.uni.db)	◆	◆	◆	-	◆	◆	◆	◆	◆	◆	-	◆	-	◆
ynode4 (studip.uni)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
ynode5 (studip.fh)	◆	😬	◆	😬	◆	◆	◆	◆	◆	◆	-	◆	-	😬
ynode8 (studip.fh.sync)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	-	◆	-	◆

Hobbit / BigBrother

Detailansicht CPU-Usage



- **MySQL Best Practices**
<http://dev.mysql.com/tech-resources/articles/mysql-administrator-best-practices.html>
- **Optimizing the mysqld variables**
<http://www.databasejournal.com/features/mysql/article.php/3449511>
- **MySQL's Query Cache**
<http://www.databasejournal.com/features/mysql/article.php/3110171>
- **MySQL Administrator Manual**
<http://dev.mysql.com/doc/administrator/en/index.html>
- **MySQL Slow Query Log Analyzer**
<http://retards.org/projects/mysql/>
- **MySQL Administrator Review**
<http://www.databasejournal.com/features/mysql/article.php/3449511>

- **Tuning Apache and PHP for Speed on Unix**
<http://phplens.com/phpeverywhere/tuning-apache-php>
- **Apache Tuning**
<http://www.mattwalsh.com/twiki/bin/view/Main/ApacheTuning>
- **httperf homepage**
<http://www.hpl.hp.com/research/linux/httperf/>
- **Apache Tuning**
<http://h07.org/projects/apachetuning/>

- MySQL Replication (Master/Slave)
- MySQL Cluster
- WebServer Load Balancing
- PHP Compiler (Zend, ...)
- ... ?

Vielen Dank für Ihre Aufmerksamkeit!