



8th International ILIAS Conference, Budapest “Power and Performance”



IT-Services
E-Learning
Content Management



- Founded in June 2000
- Services in the field of E-Learning, Content Management and IT-Services as Networks, Firewalls
- Inhouse-development of the Content Management System „MAXcms“
- Part of the ILIAS open source project since 2002
- Member of the new founded ILIAS open source e-Learning e.V. since 2009.
- Our aim:
We fulfill your requirement through innovative and individual IT-solutions based on open source technology



E-Learning

- Fullservice for ILIAS
 - Installation
 - ILIASdev:
 - 1) Customizing
 - 2) Extending of the software
 - ILIASasp: Hosting, Security, Backup, Update, Technical Support



CMS & Web

- Our Content-Management-System „MAXcms“ is used as framework for application-development
- CMS can be combined with ILIAS
- Websites and Onlineshops
- complementing modules as newsletter etc.
- webbased Databases



IT-Services

- Consulting (Planning, Implementation and Support of IT-projects at work)
- IT-Security (Firewall, Intrusion Detection System, VPN, Networks)
- Remote-maintenance
- Professional Webhosting in our Datacenter

Some References of the Databay AG



 <p>Industrie- und Handelskammer Aachen</p>	 <p>Schöningh Schroedel westermann Winklers Diesterweg</p>	 <p>HELMUT SCHMIDT UNIVERSITÄT Universität der Bundeswehr Hamburg</p>	
 <p>Deutscher Bühnenverein Bundesverband der Theater und Orchester</p>	 <p>FACULTY OF ELECTRICAL ENGINEERING & INFORMATION TECHNOLOGY</p>		 <p>STEUER-FACHSCHULE DR. ENDRISS</p>
 <p>KRANTZ Ältestes geologisches Warenhaus weltweit.</p>	 <p>ZUMTOBEL</p>	 <p>ALZHEIMER FORSCHUNG INITIATIVE e.V.</p>	 <p>malik management zentrum st.gallen</p>
 <p>Nobis Seit 1858 Backwaren & Printen</p>	 <p>Roto</p>		 <p>SK Stiftung Kultur</p>
 <p>GESS www.job-gess.de</p>	 <p>Rheinische Fachhochschule Köln University of Applied Sciences</p>	 <p>KÄNGURU Stadtmagazin für Familien in KölnBonn</p>	 <p>koelnmesse we energize your business</p>

- Linux vs. Windows – no question for large installations if you want to be able to ask anybody for experience except the NATO
- Which Linux-Distribution should be used?
- Your servers will be old and grey before your LMS and Content will be!
- Virtualization from the beginning for future scalability/migration (i.e. XEN or VMWare ESXi)

The starting point - What should be considered!



- 4/8/16 CPU Cores need a capable IO/Subsystem to scale well
- Use SAS, used HDD space will not increase surprisingly
- Redundancy in Power/Hard disk
- At least VMWare needs “certified hardware”
- ESXi can use internal USB Port/Flash for Boot

OS “layout”

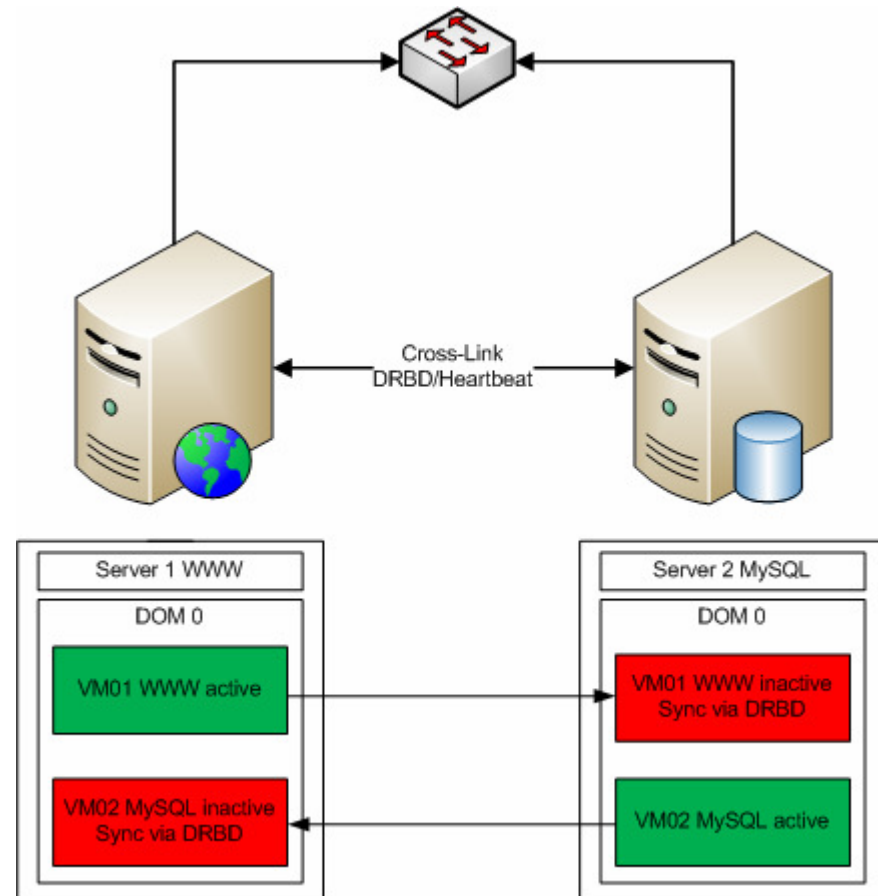


- All my hosts use LVM (Logical Volume Manager) for flexibility/snapshot Backup
- MySQL-DB can be flushed and locked
- i.e. Perl-Script: Connect MySQL, “Flush Tables with read lock;”, Take Snapshot, Disconnect MySQL, (1-5 seconds depending on load), Mount Snapshot, Backup Snapshot, Unmount and remove snapshot.

Partition/Volume	Size (of 500GB)	Remark
/dev/sda1	128MB	/boot Startpartition
/dev/sda2	2GB	Swapspace
/dev/sda5	ca. 490GB	Volume Group system
/dev/system/root	10GB	Root Filesystem
/dev/system/srv	2GB	/srv (MySQL and WWW)
/dev/system/free	5-10% of sda 5	Reserved for snapshot backups

2-Node Cluster for Performance and Availability

- Only possible with Virtualization (XEN, <http://www.xen.org/>)
- Best performance-price-ratio of possible High availability solutions
- More complex than Standby-HA
- No strict “High-Availability” under high load

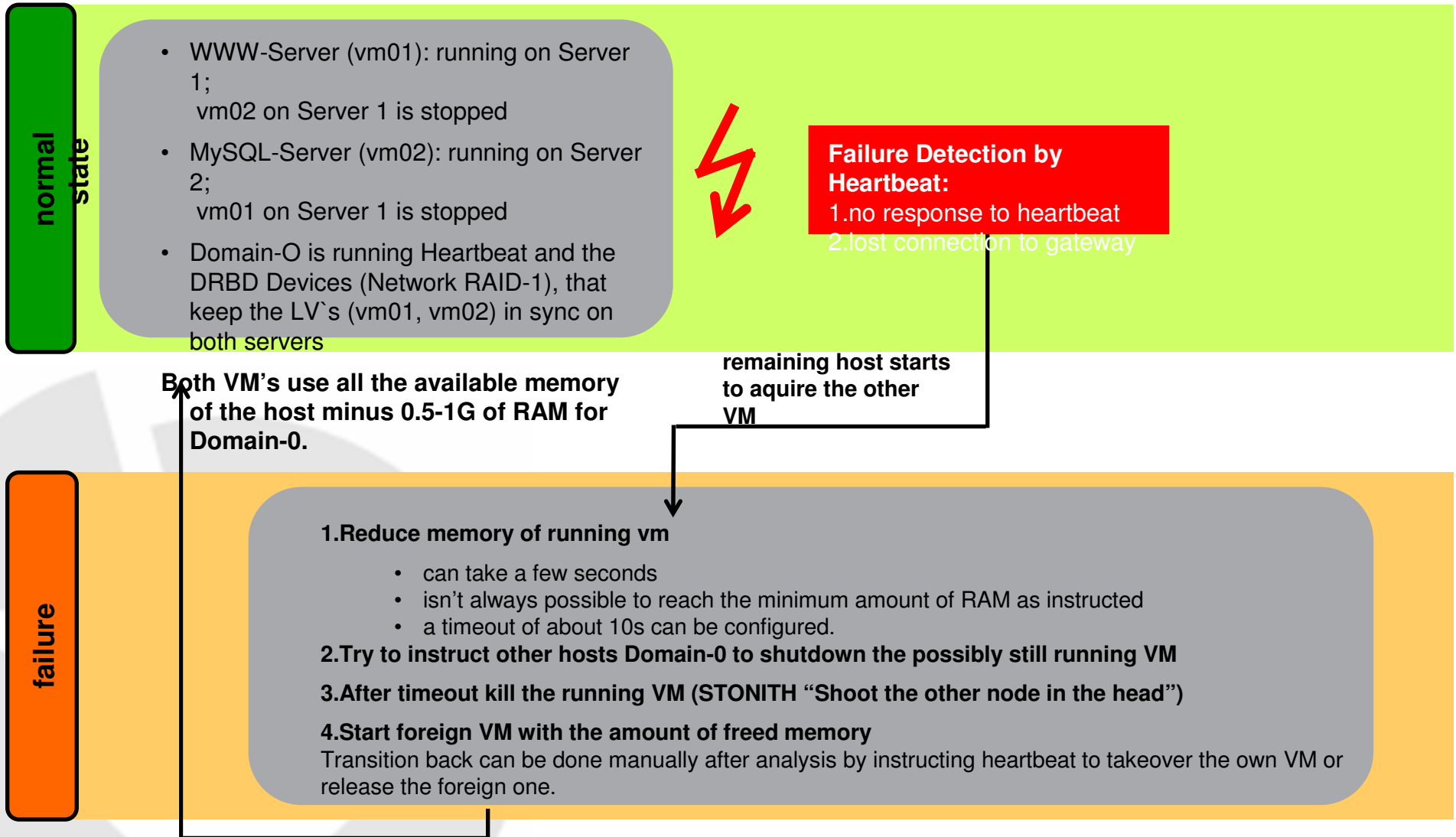


OS “layout” for 2-node cluster



Partition/Volume	Size (of 500GB)	Remark
/dev/sda1	128MB	/boot Startpartition
/dev/sda2	2GB	Swapspace
/dev/sda5	ca. 490GB	Volume Group system
/dev/system/root	10GB	Domain-0 Hostsystem
/dev/system/drbd	2GB	Metadata DRBD
/dev/system/vm01	50GB	Domain-1 MySQL Server
/dev/system/vm02	400GB	Domain-2 Webserver
/dev/system/free	5-10% of sda5	Reserved for snapshot backups

Normal state and failure, state transition

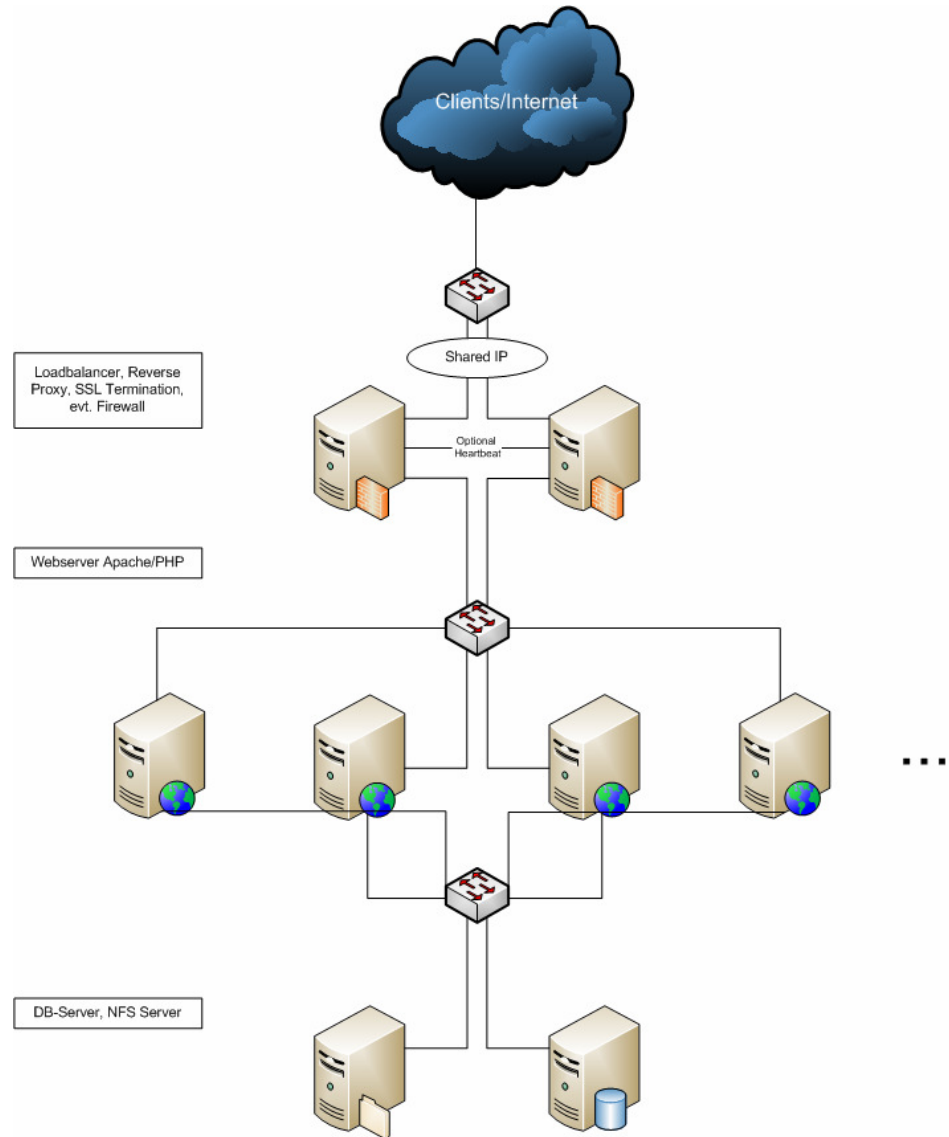


X-Node Cluster using Virtualization (1)



VM	Number	RAM	CPU	DISK	Disktype	Remark	DNS/IP	Backup
Productive VMWare Cluster								
Loadbalancer	2	512 MB	1x1Ghz	1x2GB System	VMFS	Small Ubuntu with NginX/pound Loadbalancer/Reverse Proxy, High-Availability on OS Layer (Heartbeat)	lb1, lb2 10.10.10.3, 10.10.10.4, shared IP lb, 10.10.10.2	Central Service
WWW-Server	4 bis X	4 GB	2x3Ghz	1x10GB System	VMFS	Ubuntu 8.04 LTS Server, Apache, PHP etc. High-Availability on VMWare-Layer	www1-www4, 10.10.10.5-10.10.10.8	Central Service
MySQL Server	1	16 GB	4x3Ghz	1x10 GB System 1x50 GB Daten für LVM	VMFS	Ubuntu 8.04 LTS Server, MySQL, High-Availability on VMWare-Layer Storage im SAN, HA by Hardware	mysql, 10.10.10.62	Cental Service, Snapshots, MySQL Dumps
NFS Server	1	8 GB	2x3Ghz	1x10 GB System 1x300 GB Daten	VMFS für LVM	Ubuntu 8.04 LTS Server, NFS, High-Availability on VMWare-Layer, Chat/ILIAS ilserver	nfs, 10.10.10.63	Central Service, Snapshots
Staging VMWare Cluster								
Staging-Server	2	4 GB	2x3Ghz	1x10GB System 50 GB Shared for OCFS2, GFS	VMFS	Ubuntu 8.04 LTS Server, Apache, PHP etc. High-Availability on VMWare-Layer Shared Storage SAN-based, experimental	staging1, staging2, 10.10.10.9, 10.10.10.10	Central Service

X-Node Cluster using Virtualization (2)



WWW-Servers, PHP

- Mount Partition/Volume for Documentroot with option “noatime” or “relatime”
- Apache tuning:
 1. Set “AllowOverride None”, “-FollowSymlinks, -FollowSymlinksIfOwnerMatch”.
 2. If you need nice URL’s inside ILIAS copy the rewrite rule of .htaccess in ILIAS to configuration file of VHost.
- Enable only really needed Apache and php shared modules to minimize memory-footprint
- Do use an php-cache! We use eaccelerator ([http:// eaccelerator.net](http://eaccelerator.net)) on all of our servers for an estimated performance increase of about 20-30%.
- If your Documentroot is NFS use Gigabit, Jumboframes on the Ethernet if possible check NFS options like “rsize and wsize”, use tcp and go for NFSv4 if possible.

MySQL Database

- Don't use distributions my.cnf. There are example configs like mysql-huge.cnf which are made for real servers.
- Settings to consider:
 - max_connections = 500
 - table_cache = 8192
 - key_buffer = 2048M
 - max_allowed_packet = 16M
 - *_buffer_size = X
 - max_heap_table_size = 128M
 - tmp_table_size = 256M
 - query_cache_size = 512M
 - query_cache_limit = 4M
 - thread_concurrency = 8
- Locking in mysql is done table-wide (no "row-level Locking" in MyISAM engine). This leads to locking situations under high load. It is possible to switch important tables to InnoDB Engine. Additionally in University Cologne setup "low_priority_updates = 1" increased concurrency a lot
- Indices can be optimized.
- Future work for developers: Investigate Nested Set model vs. Materialized Path, migrate to InnoDB completely or in parts, Switch Template Engine?

- NginX pronounced “Engine X” <http://nginx.net/>
- Web-Server, Reverse-Proxy, SSL-Termination, On-disk-Caching of static objects possible
- Can be a “drop in replacement” between Client and Apache-WWW-Servers which increases performance especially when serving large objects (Flash, Movies etc.) to slow clients
- Experimental: Use NginX with php-fastcgi for ILIAS standalone. Tested with lighttpd
- Pros:
 - Higher Concurrency (active Users/resources) because of low memory footprint
 - Its possible to load balance to different fastcgi-servers
 - More secure if every fastcgi-server runs under different user
- Cons:
 - New configuration style, less flexibility regarding virtual hosting

Appendix: Example Configuration, extracts



my.cnf (University Cologne, 4 CPU, 16G RAM):

```
[...]
skip-external-locking
max_connections      = 500
key_buffer = 2048M
    max_allowed_packet = 16M
    table_cache = 24576
    sort_buffer_size = 64M
    read_buffer_size = 64M
    read_rnd_buffer_size = 128M
    join_buffer_size = 256M
    myisam_sort_buffer_size = 128M
    max_heap_table_size = 128M
    tmp_table_size = 256M
    thread_cache_size = 16
    query_cache_size = 512M
    query_cache_limit = 4M
    # Try number of CPU's*2 for
thread_concurrency
    thread_concurrency = 8
    innodb_buffer_pool_size = 768M
innodb_additional_mem_pool_size = 40
    # Locking
    low_priority_updates=1
[...]
```

nginx.conf (Reverse Proxy for Apache, Caching)

```
server {
    listen 80;
    server_name myvirtualhost.com;

    location / {
        proxy_pass http://127.0.0.1;
        proxy_redirect default;
        proxy_set_header Host $host;
        proxy_set_header X-Real-IP $remote_addr;
        proxy_set_header X-Forwarded-For proxy_add_x_forwarded_for;
    }

    # static file caching
    location ~*
.+\. (jpe?g|gif|png|mp3|htm|html|css|js|pdf|crt|pem|der|xls|xml|d
oc|ods|odt|ico|zip|tgz|gz|rar|bz2|exe|ppt|txt|tar|mid|midi|wav|b
mp|rtf|swf|avi)$ {
        proxy_pass http://127.0.0.1;
        proxy_redirect default;

        proxy_cache_path /var/lib/nginx/proxy/cache levels=1:2
keys_zone=one:10m inactive=7d max_size=2g;
        proxy_temp_path /var/lib/nginx/proxy/tmp;
        proxy_cache one;
        proxy_cache_key $request_uri;
        proxy_cache_valid 200 1h;
        proxy_cache_use_stale error timeout invalid_header;
    }
}
```

Thanks for your
attendance!

