Implementation of Virtual Desktop Infrastructure (VDI) in an academic laboratories

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Virtual Desktop Infrastructure (VDI) in laboratories
General benefits from VDI

- Better Management
- Better Security
- Easy OS migrations
- VDI Image
- Snapshot technology
- Go Green
- Independence of Hardware
Client-Server Infrastructure
Just a small Data Center

We have VMware 2 clusters

• vCenter1 for servers - 5 hosts and 123 virtual servers
• vCenter2 – for students – 6 hosts and 356 virtual desktops

The project is running from 2011 (after 1 year from started building) and we are one of the first school in Poland
Zero-client terminal

- No classic CPU (like Intel core)
- No Hard drivers
- No Operations systems
- No maintenance,
- JUST only special Chip to decode PcoIP stream and display them
We use zero-client integrated with display

So we trashed a ton’s of cables ;}
Our laboratories
Better use a CPU time (also others resources)
Benefits for student’s labs

The cost of energy

- The average using of power typical computer is about 100 Watts (with display) per 1 computer
- 1 zero-client terminal use 25-30 Watts
Benefits for student’s labs

Cost of equipment replacement

• Before VDI we always needed to replace some computers because they are too old. Now we don’t care for a long time.

• Average replacing time typical computer was 4-5 years. Now we planning 8-10 years replacing.
What is most expensive?
Benefits for student’s labs

Expenses of maintaining administration

• Before VDI we have had 6 people to installing software, maintainance windows, updates etc.
• Now we have 1 person for administrate all of them + servers + mass storage

Average cost of 1 person ~ 12.000 up to 16.000 EURO per year
Benefits for student’s labs– gold image

START

Administrator prepare 1 virtual machine as Gold Image

Image is cloning X Times and we have X virtuals windows for each student

If we need instal new software (and updates etc) we do it 1 time in gold image

After this we click recompose and all virtual machines refreshed
The administrator prepares a single system image, the so called "Gold Image" (also known as “copu-on-write”) which will be available in read-only option, then cloning of each image and creating a virtual system does not copy the entire image. The system reads the data from the golden image and all the changes that are implemented in the virtual system are stored in so called paintings, the "Linked Clone".
Some benefits - refreshing

**Instant Refreshing virtual systems** - one of the implications of the golden images is the fact that if a virtual operating system only reads data from the golden image (without the possibility of writing anything on it) and all the changes differential writes on "Linked Clone", is to delete the data in this place immediately restore the clean image of the.
Our laboratories

- 8 laboratories with ZERO CLIENT terminals
- 240 ZERO CLIENTS Workstations
- Over 356 virtual machines for students (7 versions of systems for different classes)
- Computing by SIX two-processors blade server’s with 1.2 TB in summary
- Storage – 16 TB on hard disks with SSD cache
And dedicated laboratory
We started with Dell Blade’s servers... 
..but the blade’s are not enough
The problems with PCoIP Protocol
Because we need to encode the PCoIP stream

Of course no body told us about this ;)

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Because we need to encode the PCoIP stream
Apex 2800

So before buying server check if you can use this card

Teradici PCoIP Hardware Accelerator specifications

PCle Card

» PCIe x4 slot Gen 2.0
» Half height, half length (HHHL) card

Mezzanine for HP Gen8 Blade Servers

» for HP ProLiant Gen8 blades (WS460c, BL460c)

Mezzanine for Dell servers (DXM-A by Amulet Hotkey)

» for Dell M Series blades (M420, M520, M620)

Table showing maximum number of displays supported

<table>
<thead>
<tr>
<th>DISPLAY RESOLUTION</th>
<th>PORTRAIT MODE</th>
<th>LANDSCAPE MODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2560x1600</td>
<td>25</td>
<td>40</td>
</tr>
<tr>
<td>1920x1200</td>
<td>40</td>
<td>64</td>
</tr>
<tr>
<td>1680x1050</td>
<td>50</td>
<td>85</td>
</tr>
<tr>
<td>1280x1024</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

System requirements
PcoIP Hardware acceleration in practice

CPU usage is reduced by 40% with APEX 2800 for sessions with continuous video playback.

The other element tested on the server was the impact of the card on the end user experience, when the server CPU, or vCPU, starts to exceed recommended thresholds (over 75% for server CPU, over 80% for vCPU). By freeing up valuable CPU cycles, the card was able to indirectly improve the end user experience, enabling smoother video and crisp audio playback, for example.
Graphics in virtual machines

• It’s possible to use windows XP and Windows 7 with only software accelerate of Graphics Unit (it’s enough for Office etc.)

• But sometimes we need to use hardware acceleration
Graphics in virtual machines

- We use Nvidia Grid K1 video accelerating cards to provide virtual desktops for owner students.
How to put the card inside blade server??

So before buying server check if you can use this card
Thank you