

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



Wrocław University
of Economics

– **case study**

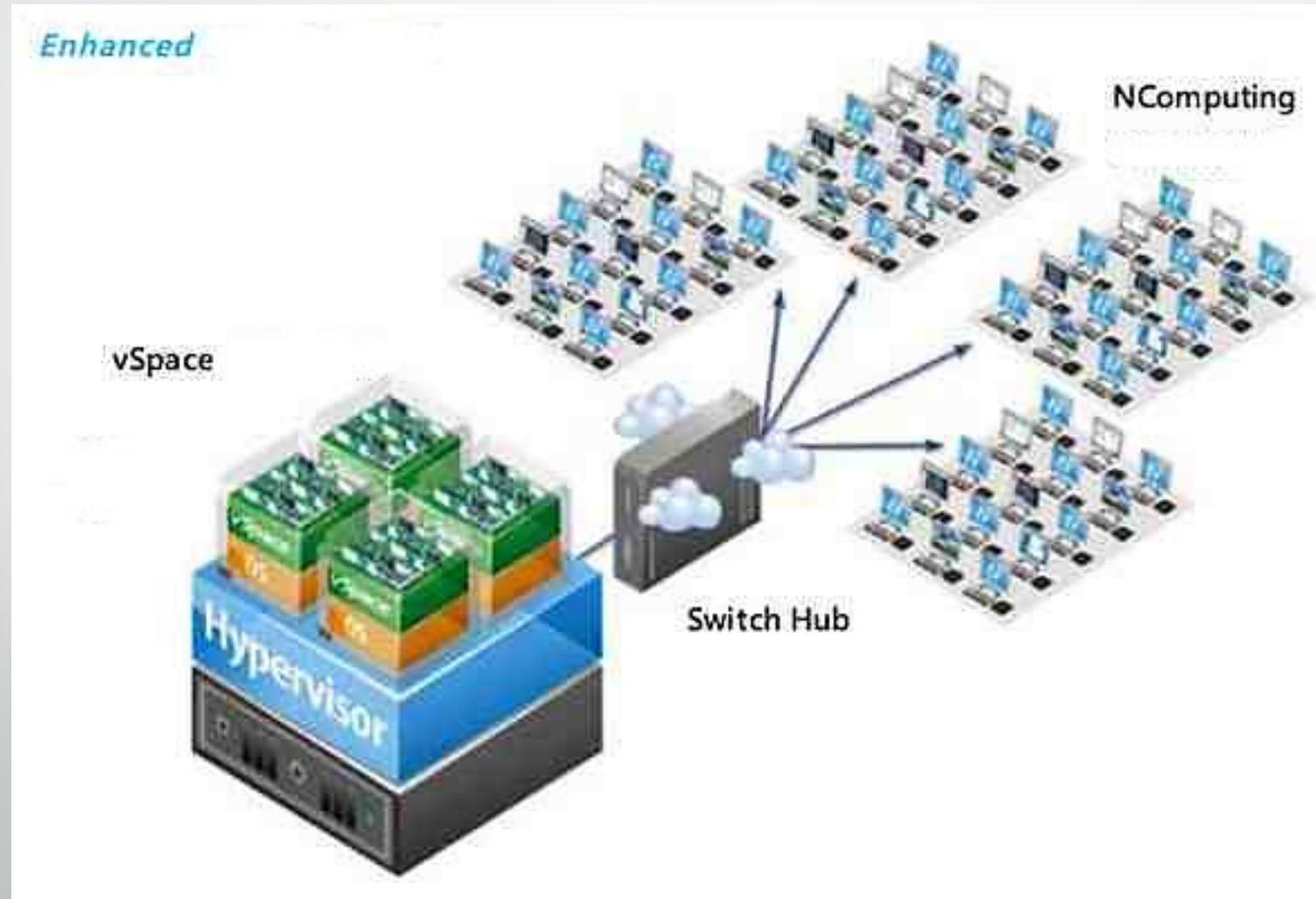
Paweł Chrobak



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Virtual Desktop Infrastructure (VDI) in laboratories

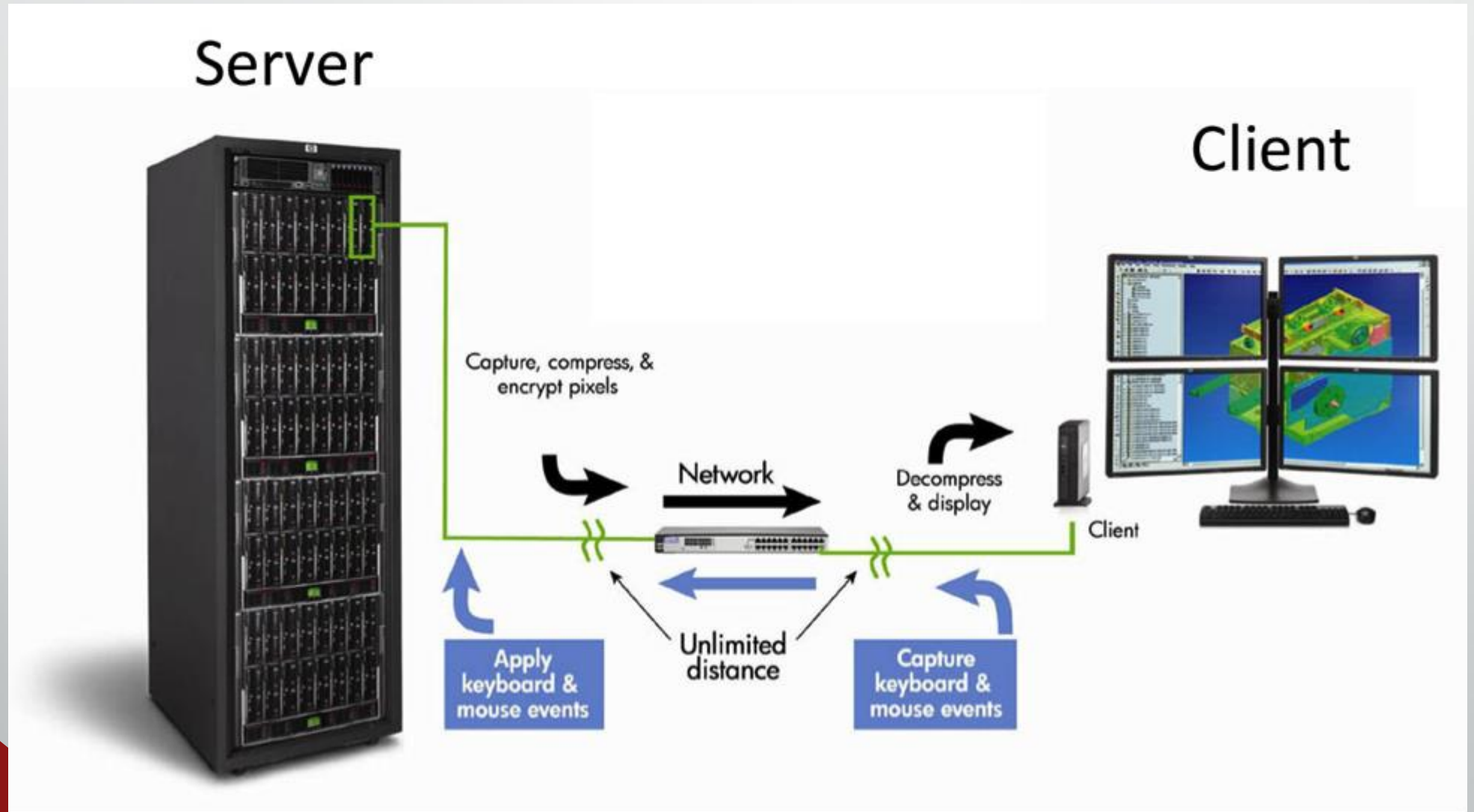




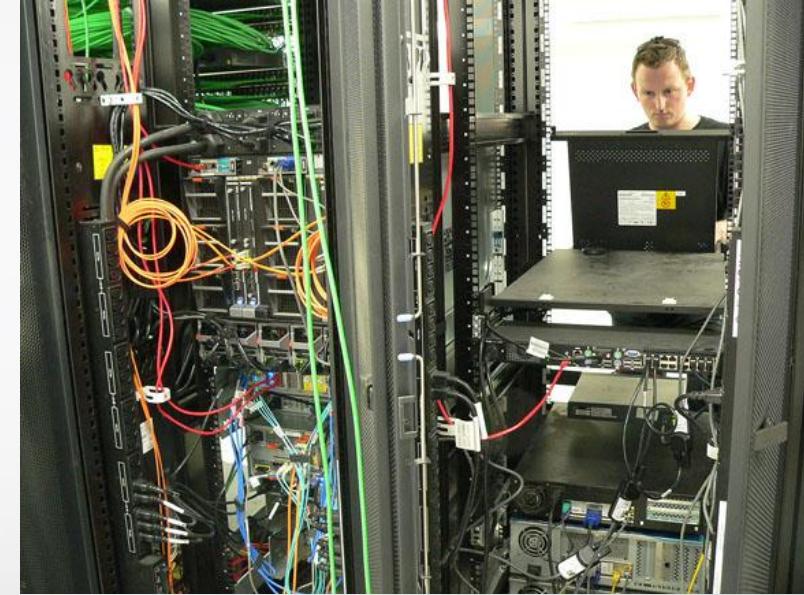
General benefits from VDI

- 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



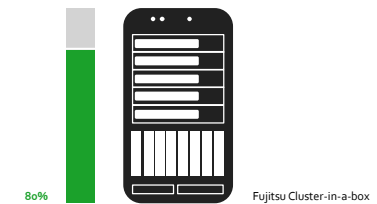
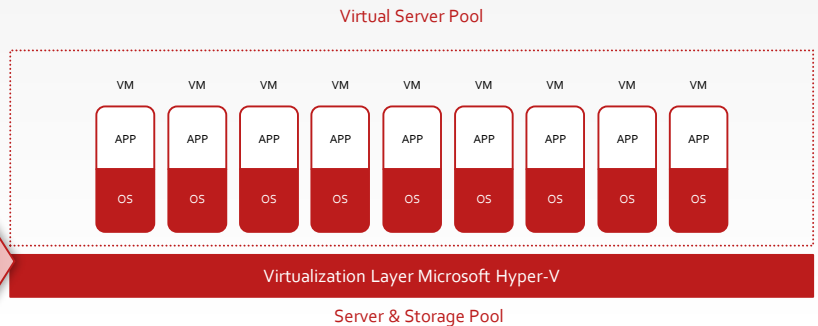
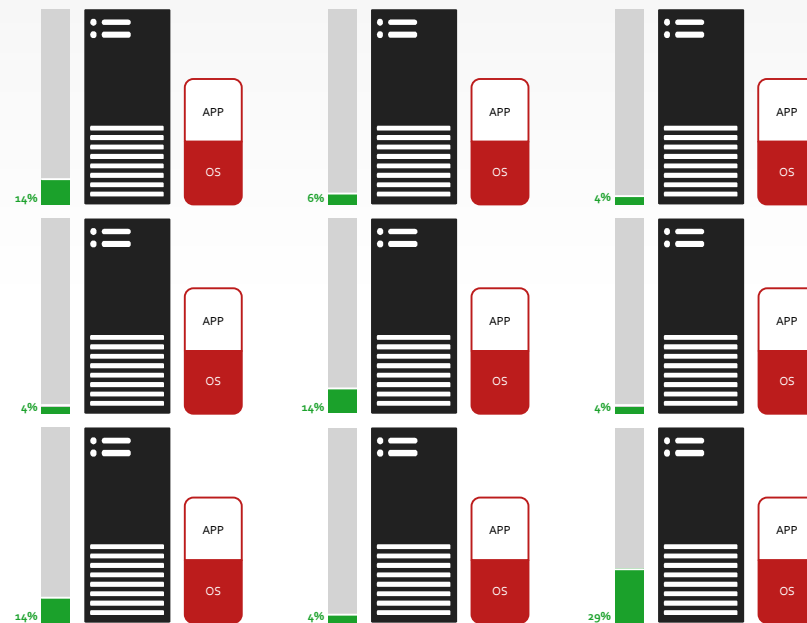
So we trashed a ton's of cables ;)

Our laboratories



Better use a CPU time (also others resources)

The physical world



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

GENERAL

Typical	23W
Maximum	46W
Stand-by	Less than 1.0 W

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

Samsung Samsung NC241-T 23.6-Inch Monitor

by Samsung

[Be the first to review this item](#)

List Price: ~~\$660.15~~

Price: **\$399.99** + \$12.99 shipping

You Save: **\$260.16 (39%)**

Only 1 left in stock.

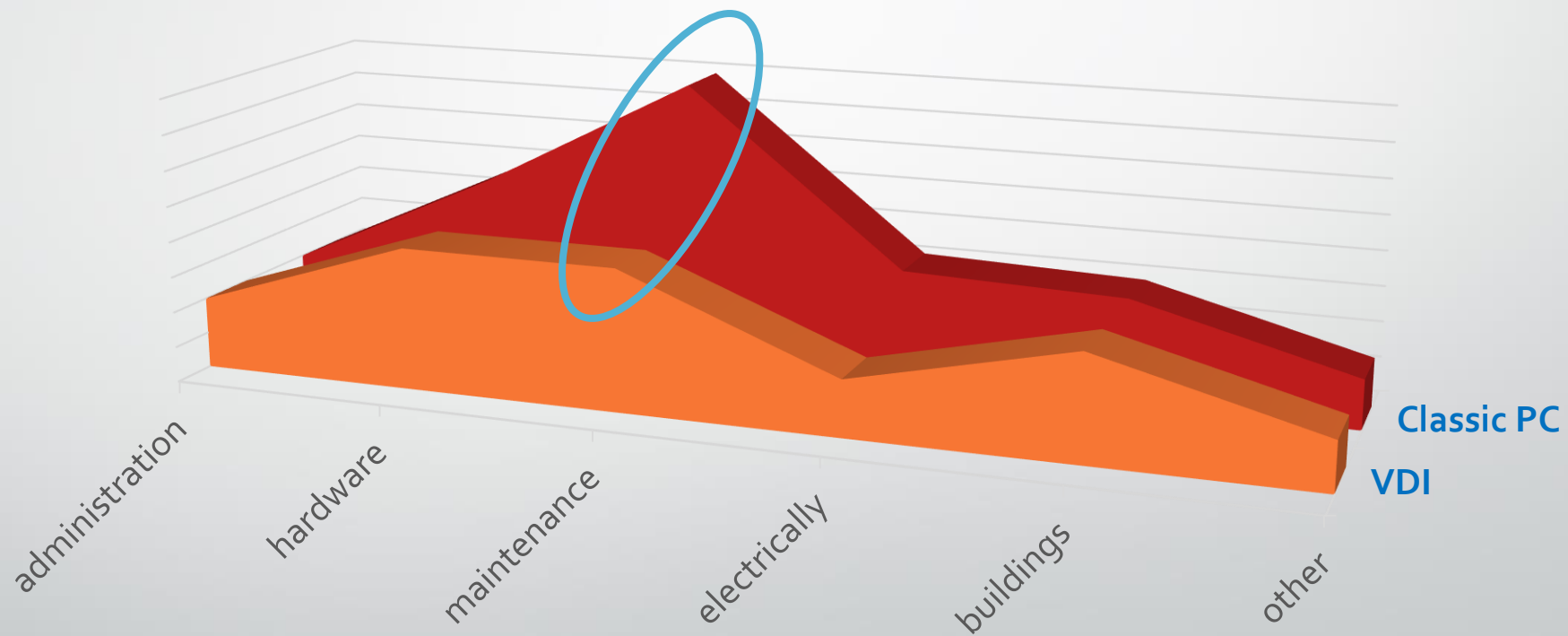
Ships from and sold by [Sell 4less](#).

This item does not ship to Legnica, Poland.

- 23.6" (16:10) Screen Size
- Resolution: 1920 x 1080 (Dual Screen 1920 x 1200)
- Simplify and Secure the Desktop
- Seamlessly Migrate to VDI
- Achieve Higher Performance with Greater Efficiency

What is most expensive ?

Total costs of laboratories



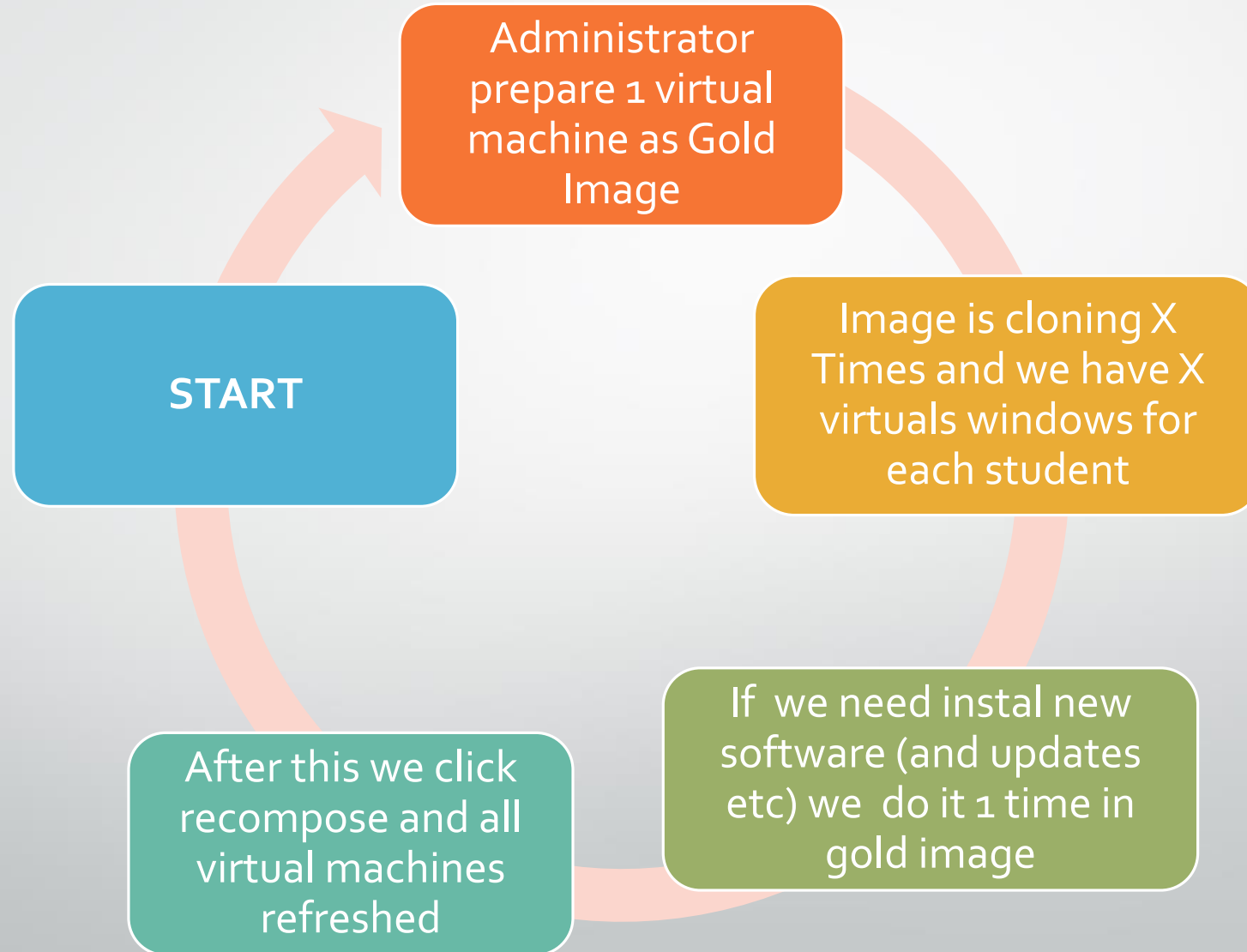
Benefits for student's labs

Expenses of maintaining administration

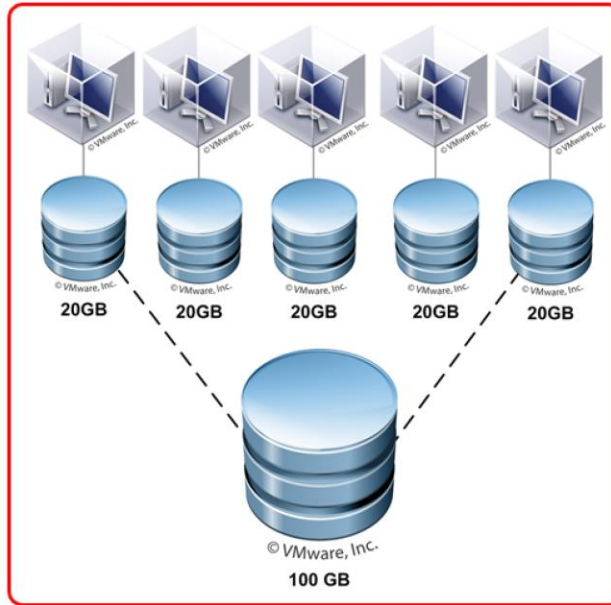
- Before VDI we have had 6 people to installing software, maintenance windows, updates etc.
- Now we have 1 person for administrate all of them + servers + mass storage

Average cost of 1 person ~ 12.000 up to 16.000 EURO per year

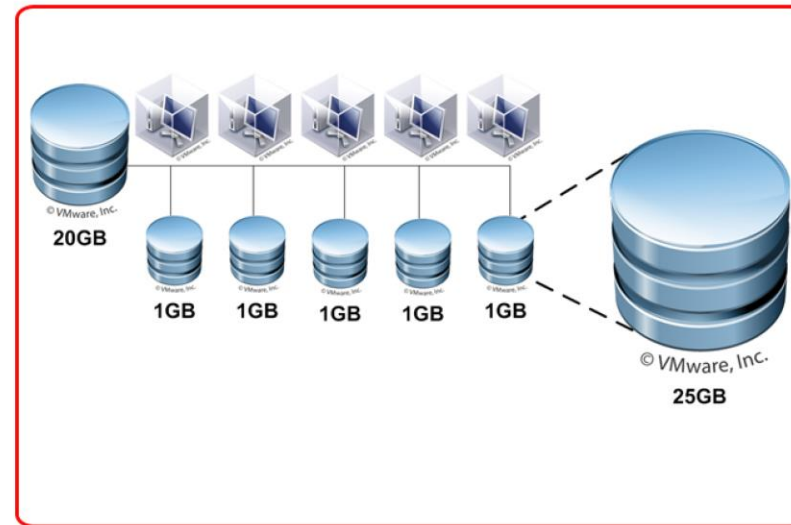
Benefits for student's labs– gold image



Link clones - technology



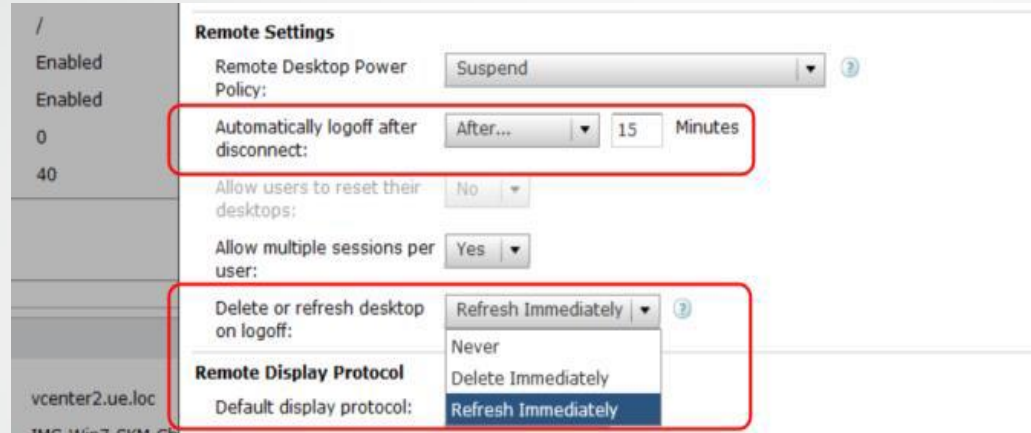
Classic allocation of virtual disks



Technique "Gold Image" and "Linked Clone"

The administrator prepares a single system image, the so called "Gold Image" (also known as "copy-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".

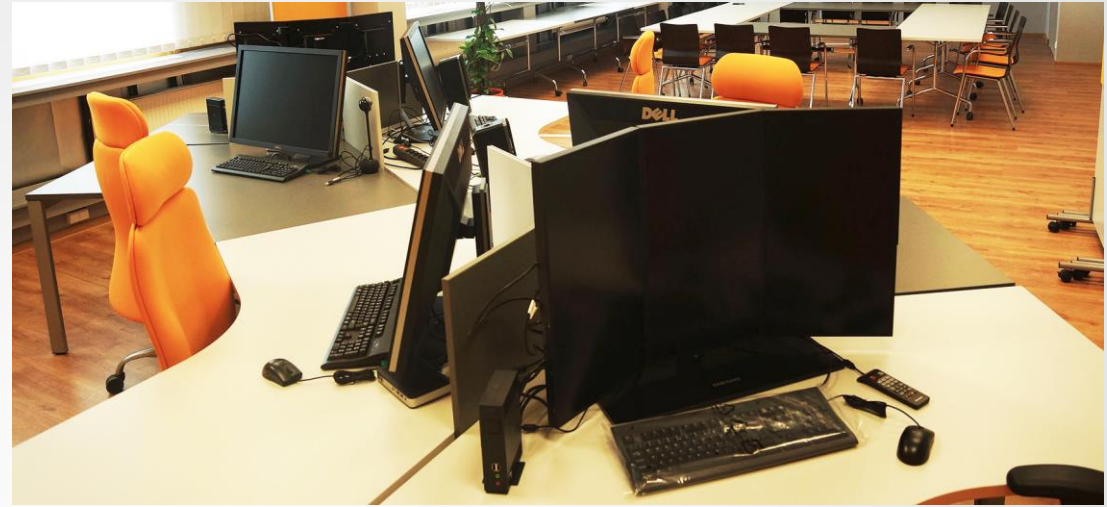
Some benefits - refreshing



Instant Refreshing virtual systems - one of the implications of the golden images is the fact that if a virtual

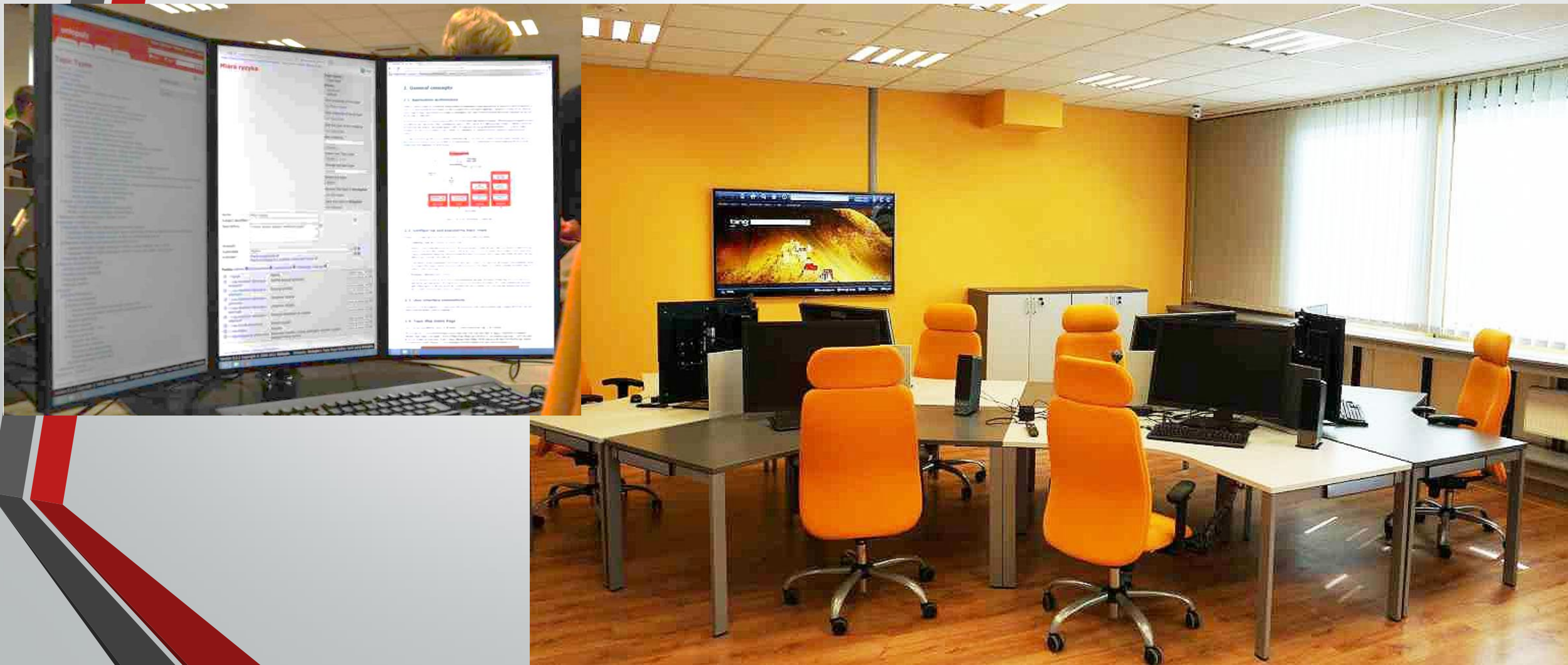
operating system only reads data from the golden image (without the possibility of writing anything on it) and all the changes differential writes on "Linked Clone", is to delete the data in this place immediately restore the clean image of the.

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

The screenshot shows a YouTube video player with the title "RemoteFX v2 – Render, Capture, Compress". The video content includes a diagram illustrating the RemoteFX process: CPU (Soft GPU) feeds into GPU (vGPU), which then feeds into a "Capture" step, followed by a "Compress" step, and finally an "API" output. The "Compress" step lists: 1. Text: text-specific (clear), 2. Image: RFX 2.0 (p), 3. Video: H.264 or RFX. Below the diagram, it says "E2EVC.com Video on YouTube Sponsored by: The Dynamic Desktop Delivery Specialist - http://virtualengine.co.uk". The video player interface shows a progress bar at 20:30 / 1:05:02 and a description area below the video.

RemoteFX v2 – Render, Capture, Compress

CPU Soft GPU GPU vGPU

Identify different capture areas: Text, image, video/animation

Compress: 1. Text: text-specific (clear) 2. Image: RFX 2.0 (p) 3. Video: H.264 or RFX

E2EVC.com Video on YouTube Sponsored by: The Dynamic Desktop Delivery Specialist - http://virtualengine.co.uk

Remoting protocol comparison ICA HDX PCOIP RemoteFX

ThePubForum 3 363

Opublikowany 12 sie 2013

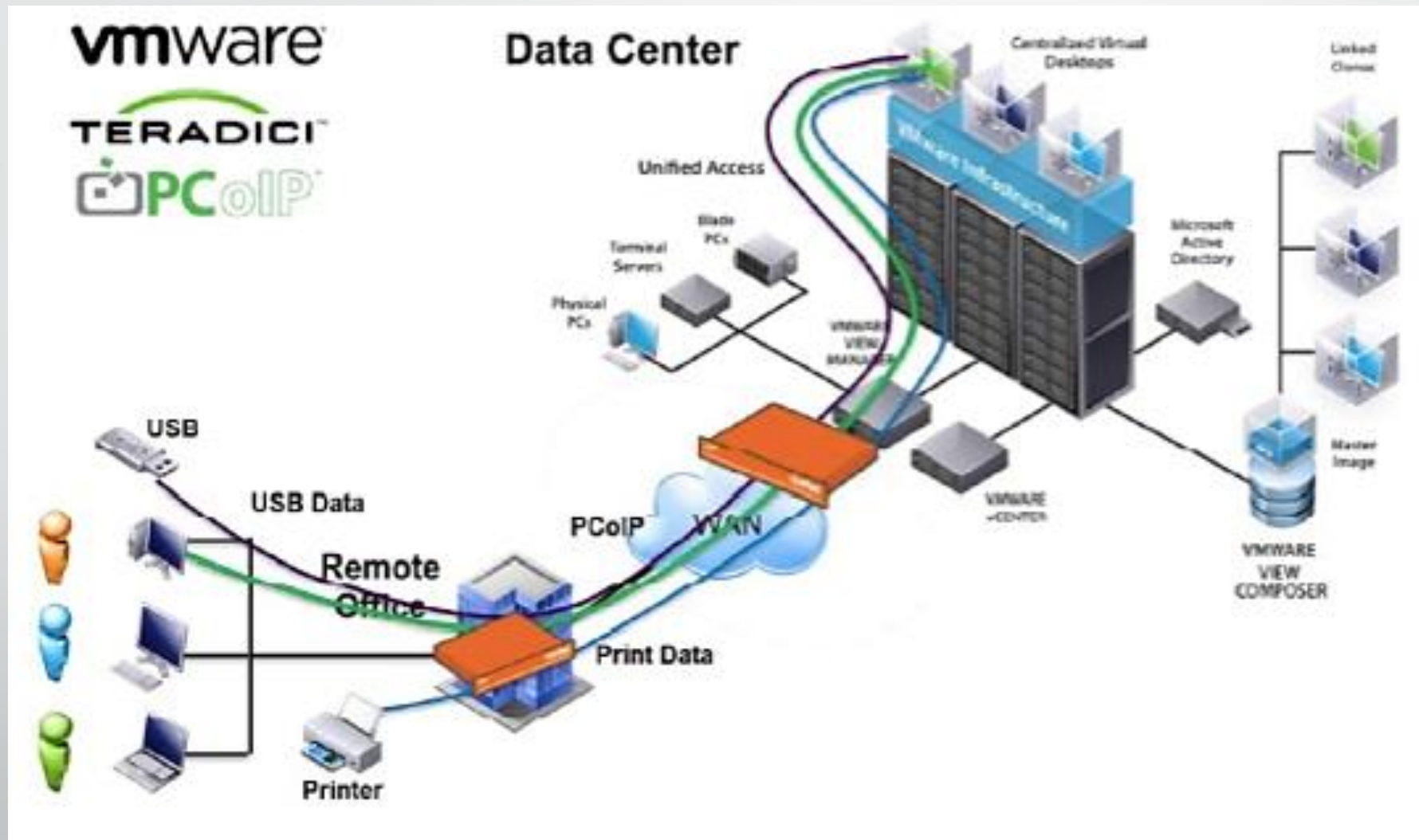
Kategorie: Nauka i technika

Licencja: Standardowa licencja YouTube

The screenshot shows the Windows Task Manager window with the 'Procesy' (Processes) tab selected. A red rectangle highlights the first two rows of the process list: 'plugin-container.exe' and 'VMWVypHelper.exe'. The table lists various processes, including system services and user applications, along with their CPU and memory usage.

Nazwa obrazu	Nazwa użytkownika	CPU	Użyte pa...
plugin-container.exe	student	56	127 108 K
VMWVypHelper.exe	student	00	4 344 K
pcoip_server_win32.exe	SYSTEM	24	53 872 K
firefox.exe	student	02	327 792 K
VMwareViewClipboard.exe	student	00	5 112 K
taskmgr.exe	student	03	4 456 K
hpsug.exe	student	00	4 176 K
OrderReminder.exe	student	00	2 196 K
explorer.exe	student	00	20 096 K
mspaint.exe	student	00	1 168 K
alg.exe	USŁUGA LOKALNA	00	3 616 K
svchost.exe	USŁUGA LOKALNA	00	3 840 K
ctfmon.exe	student	00	3 428 K
rg5Tr.exe	SYSTEM	00	1 408 K
svchost.exe	SYSTEM	00	6 100 K
v4v_agent.exe	SYSTEM	00	3 416 K
spoolsv.exe	SYSTEM	00	8 176 K
VMwareView-rdeServer.exe	SYSTEM	00	6 828 K
vmtoolsd.exe	SYSTEM	00	11 888 K
wssm.exe	student	00	6 728 K
svchost.exe	USŁUGA LOKALNA	00	4 196 K
OSPPSVC.EXE	USŁUGA SIECIOWA	00	20 284 K
svchost.exe	USŁUGA SIECIOWA	00	3 812 K
svchost.exe	SYSTEM	00	21 620 K
svchost.exe	USŁUGA LOKALNA	00	2 932 K
wsnm.exe	SYSTEM	02	11 124 K
svchost.exe	USŁUGA LOKALNA	00	2 956 K
svchost.exe	USŁUGA SIECIOWA	00	4 388 K
svchost.exe	SYSTEM	00	5 176 K
vmacthlp.exe	SYSTEM	00	2 600 K
lsass.exe	SYSTEM	00	5 284 K
services.exe	SYSTEM	00	5 668 K
winlogon.exe	SYSTEM	00	5 276 K
csrss.exe	SYSTEM	00	5 044 K

Because we need to encode the PCoIP stream



Of course no body told us about this ;)

Apex 2800



Teradici PCoIP Hardware Accelerator specifications

PCIe 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

HARDWARE ACCELERATOR

DISPLAY RESOLUTION	PORTRAIT MODE	LANDSCAPE MODE
2560x1600	25	40
1920x1200	40	64
1680x1050	50	85
1280x1024	100	100

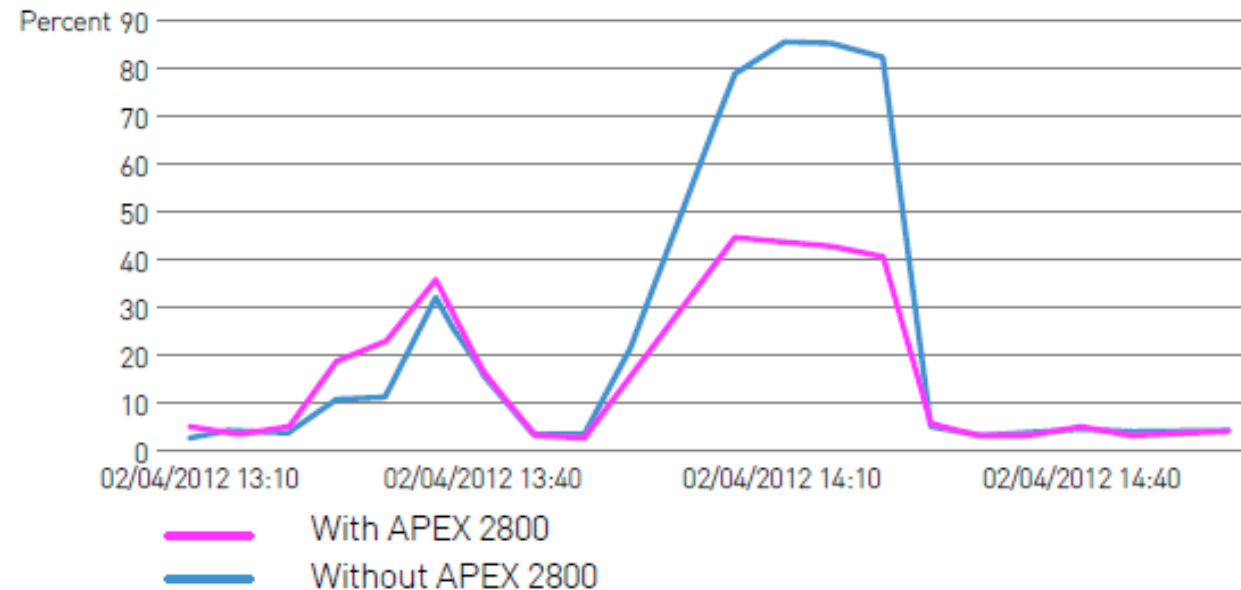
System requirements

So before buying server check if you can use this card

PcoIP Hardware acceleration in practice

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

CPU performance



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

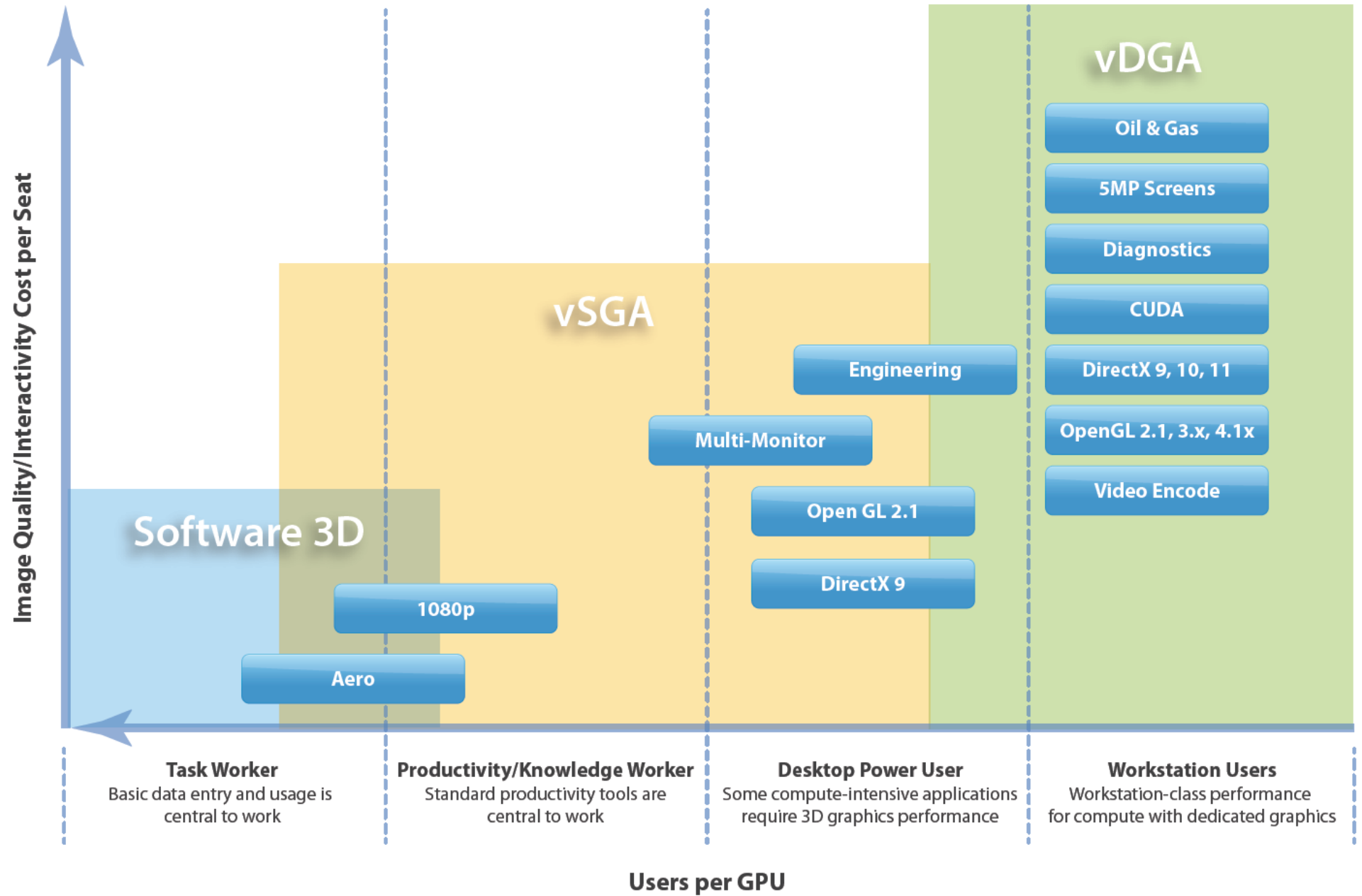
- We use Nvidia Grid K1 video accelerating cards to provide virtual desktops for owner students



Specifications




	GRID K1	GRID K2
Number of GPUs	4 Kepler GPUs	2 high-end Kepler GPUs
Total NVIDIA® CUDA® cores	768	3,072
Total memory size	16 GB DDR3	8 GB GDDR5
Max power	130 W	225 W
Board length	10.5"	10.5"
Board height	4.4"	4.4"
Board width	Dual slot	Dual slot
Display IO	None	None
Aux power	6-pin connector	8-pin connector
PCIe	x16	x16
PCIe generation	Gen3 (Gen2 compatible)	Gen3 (Gen2 compatible)
Cooling solution	Passive	Passive



How to put the card inside blade server ??



GRID CERTIFIED SERVERS

 [Download the GRID OEM Solutions Guide here](#)



[Cisco UCS C460 M4](#)
[Cisco UCS C240 M3](#)

up to 2 GRID K1 or 2 GRID K2
up to 2 GRID K1 or 2 GRID K2



Special Dell Trial Offer - [North America](#).

[Dell PowerEdge R720](#)
[Dell PowerEdge T620](#)
[Dell PowerEdge VRTX](#)
[Dell PowerEdge C8220K](#)
[Dell Precision R7610](#)

up to 2 GRID K1 or 2 GRID K2
up to 3 GRID K2
up to 1 GRID K2
up to 2 GRID K2
up to 3 GRID K2



[FUJITSU CELSIUS C620](#)
[FUJITSU CELSIUS R930](#)
[FUJITSU PRIMERGY CX270 S2](#)
[FUJITSU PRIMERGY RX350 S8](#)
[FUJITSU PRIMERGY TX300 S8](#)

up to 1 GRID K2
up to 2 GRID K1 or 3 GRID K2
up to 1 GRID K1 or 1 GRID K2
up to 2 GRID K1 or 2 GRID K2
up to 2 GRID K1 or 2 GRID K2



Special HP Trial Offer - [North America](#).

[HP DL380Z Gen8 Virtual Workstation](#)
[HP ProLiant DL380p Gen8](#)
[HP ProLiant DL580 Gen8](#)
[HP ProLiant WS460c Gen8](#)
[HP ProLiant SL250s Gen8](#)
[HP ProLiant SL270s Gen8 SE](#)

up to 2 GRID K2
up to 2 GRID K1 or 2 GRID K2
up to 5 GRID K2
up to 1 GRID K1 or 1 GRID K2
up to 3 GRID K2
up to 4 GRID K2



[IBM NeXtScale nx360 M4](#)
[IBM iDataPlex dx360 M4](#)
[IBM Flex System](#)

up to 2 GRID K1 or 2 GRID K2
up to 2 GRID K1 or 2 GRID K2
up to 1 GRID K1 or 1 GRID K2



[Lenovo ThinkStation C30](#)
[Lenovo ThinkStation D30](#)
[Lenovo ThinkStation S30](#)

up to 1 GRID K2
up to 2 GRID K2
up to 1 GRID K2

So before buying server check if you can use this card

Thank you



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