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

Wrocław University of Economics

– case study

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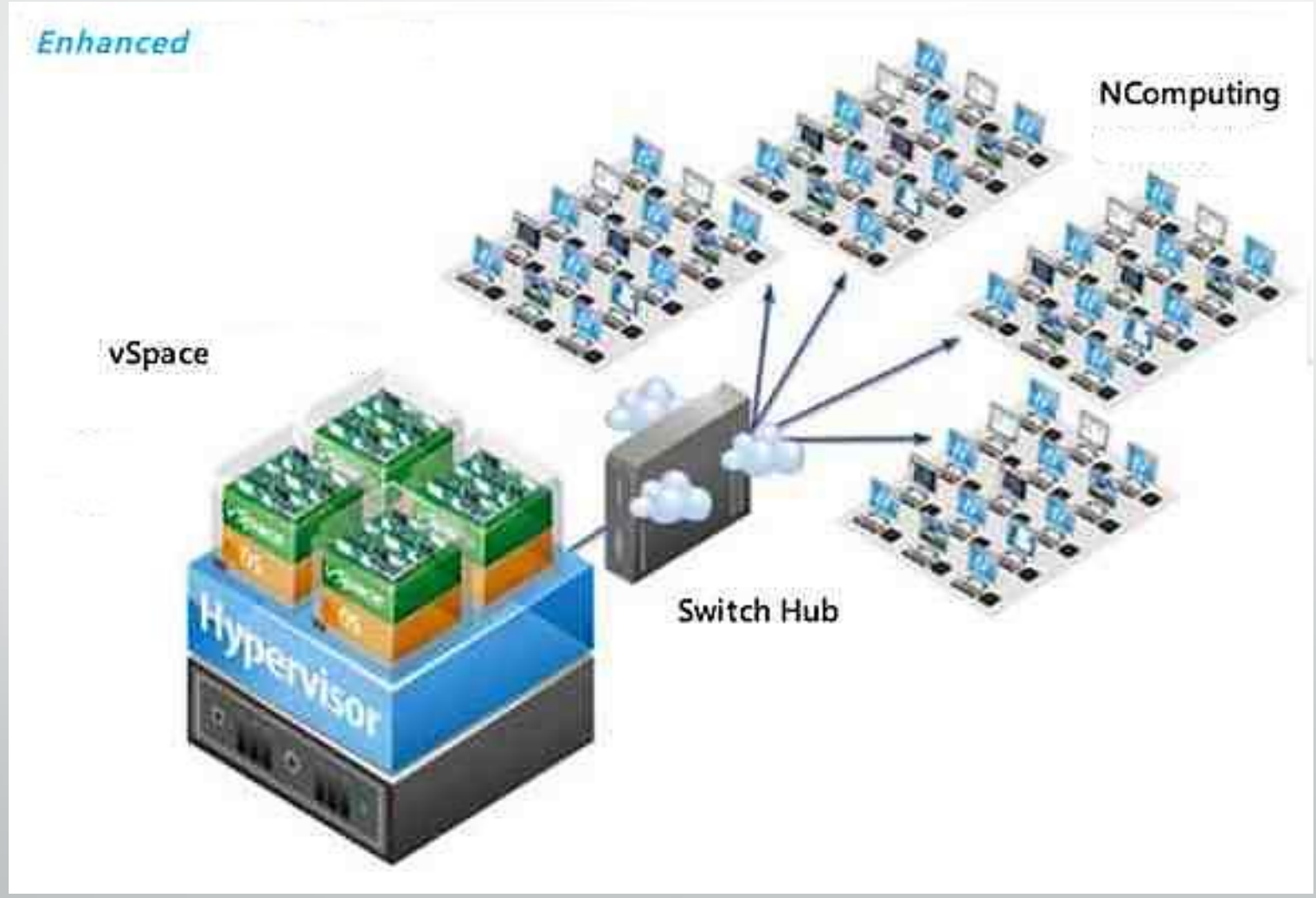
FedCSIS

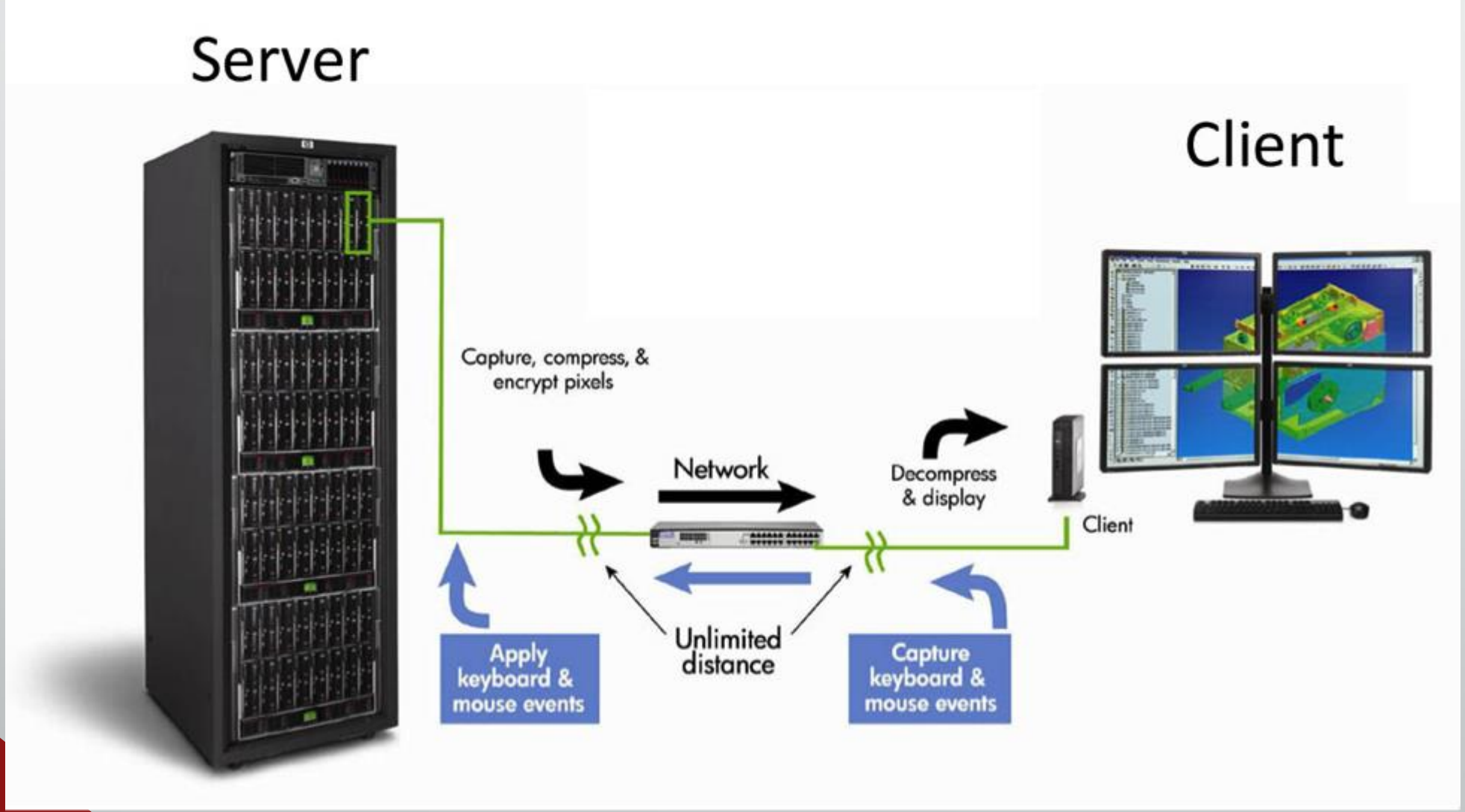
Virtual Desktop Infrastucture (VDI) in laboratories



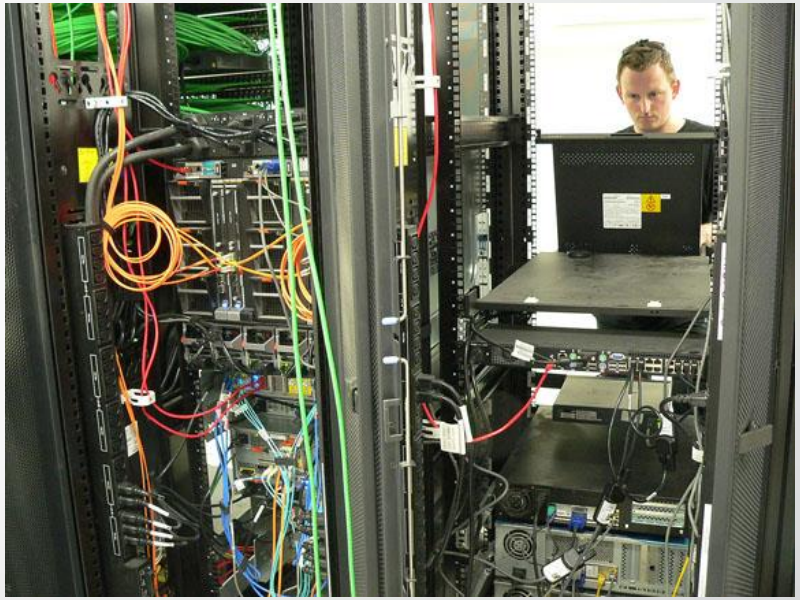
General benefits from VDI

- 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

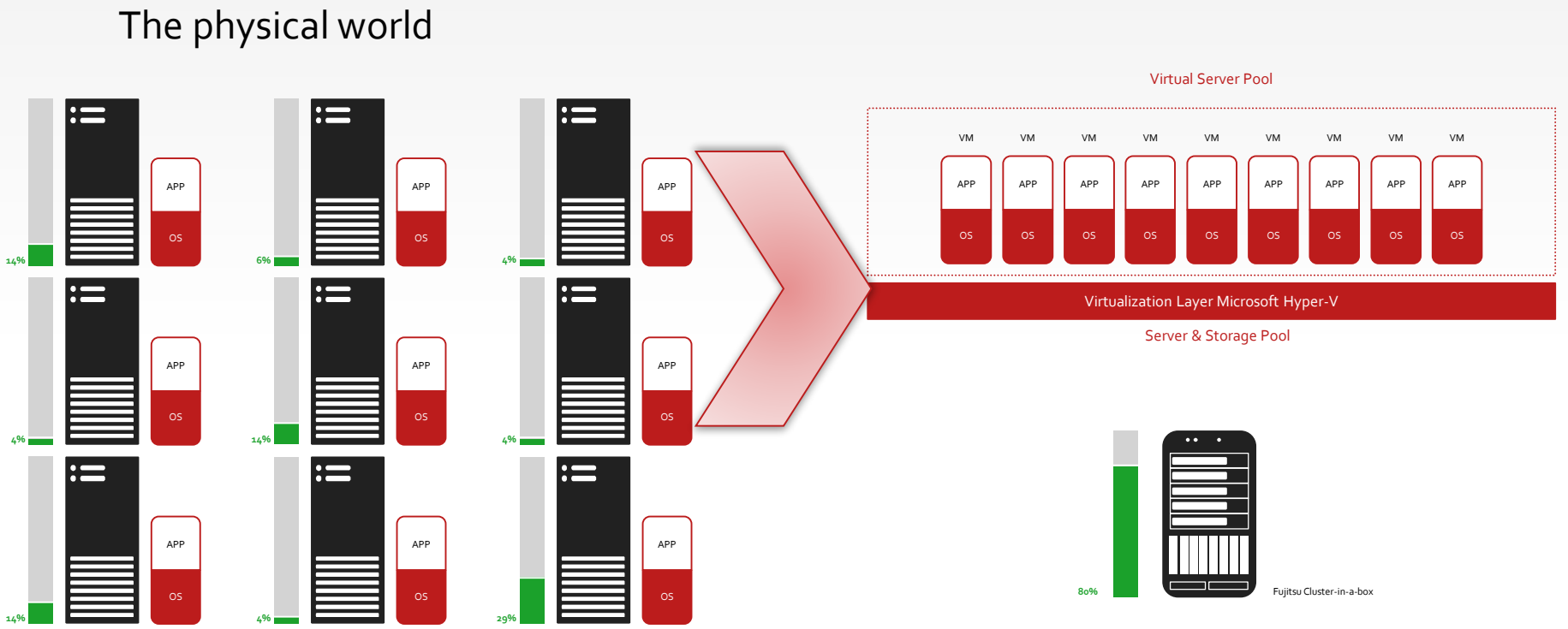
- No classic CPU (like Intel core)
- No Hard drivers
- No Operations systems
- No maintenance,
- JUST only special Chip to decode PcoIP stream and display them

We use zero-client integrated with display

So we trashed a ton’s of cables ;)

Our laboratories

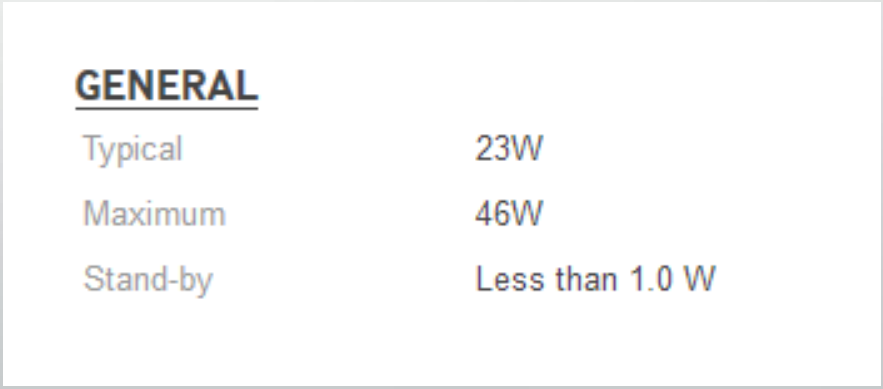
Better use a CPU time (also others resources)



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



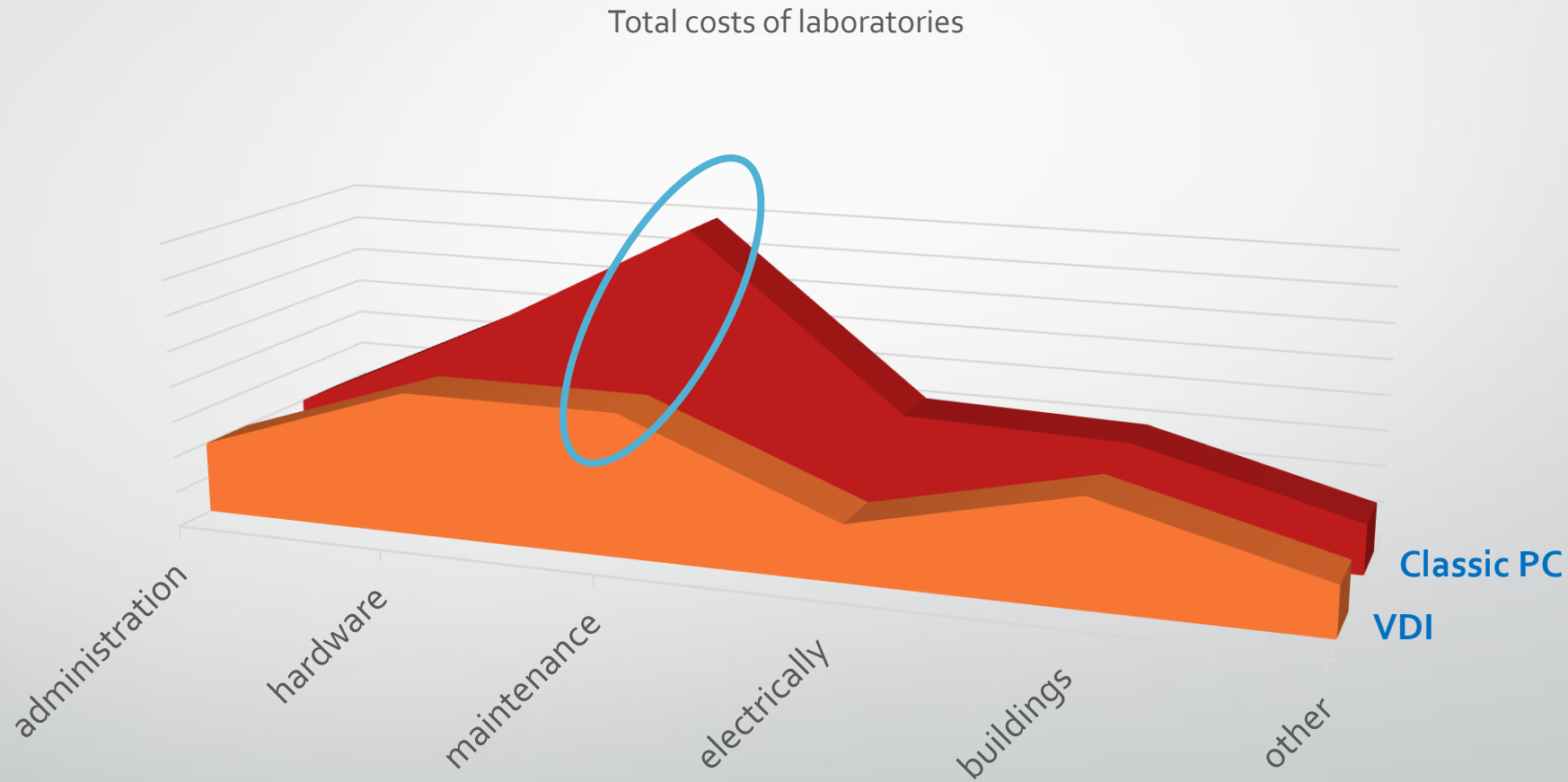
GENERAL	
Typical	23W
Maximum	46W
Stand-by	Less than 1.0 W

Benefits for student's labs

Cost of equipment replacement

- Before VDI we always needed to replace some computers becouse they are to 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 ?



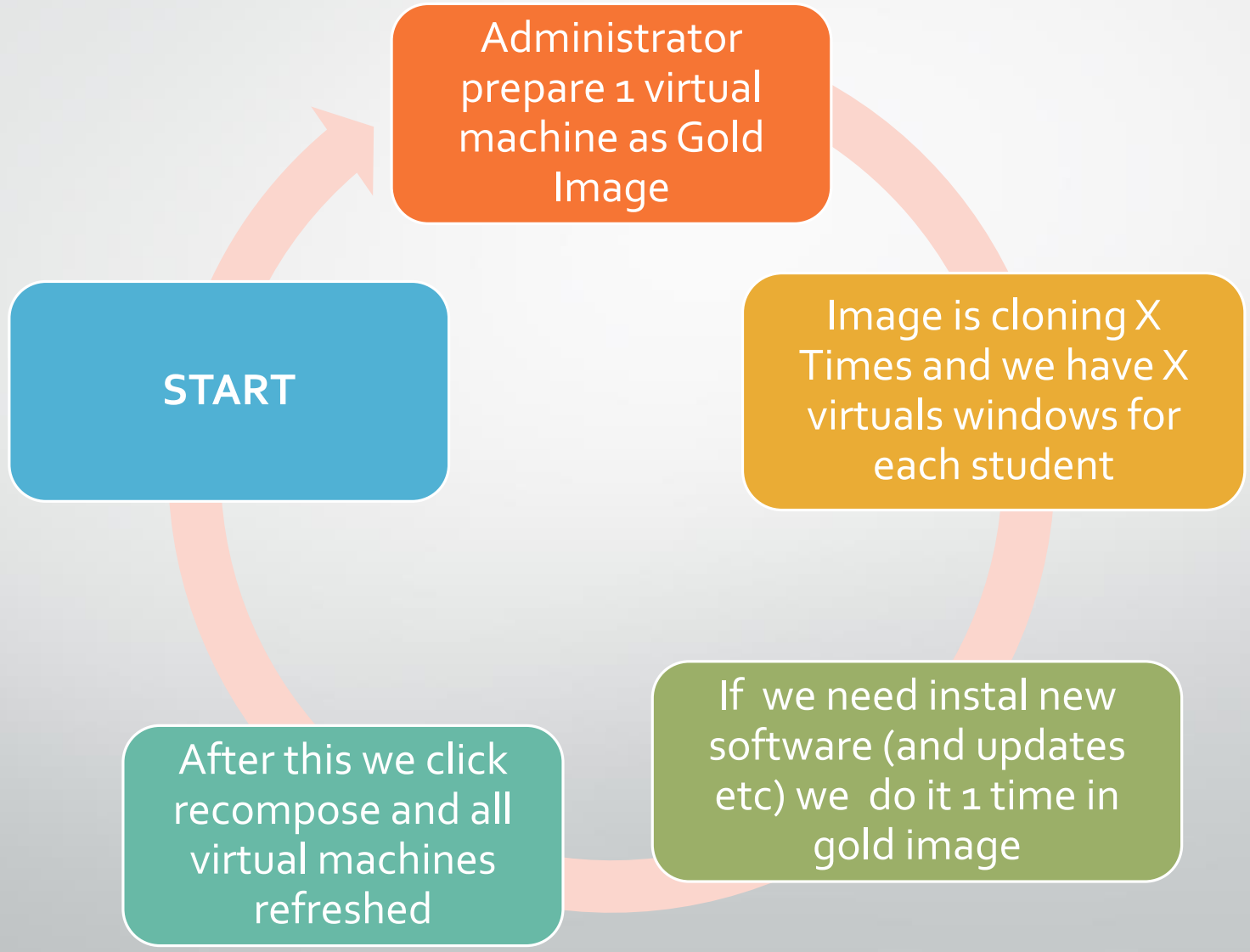
Benefits for student's labs

Expenses of maintaining adminstration

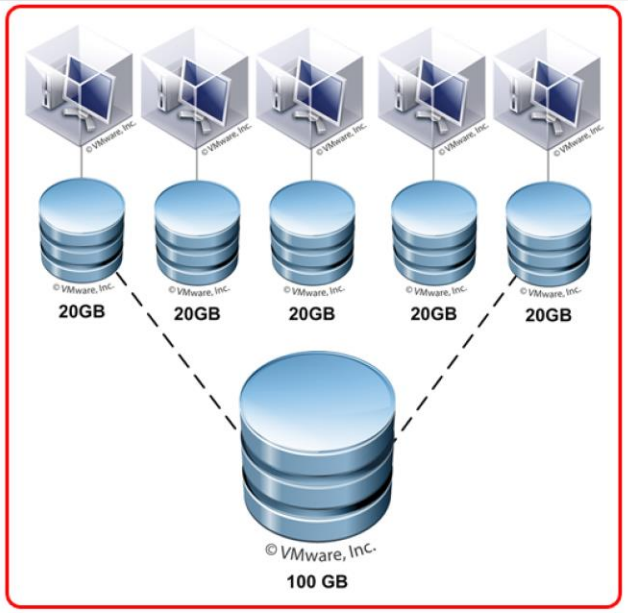
- Before VDI we have had 6 people to installing software, maintnance windows, updates etc.
- Now we have 1 person for administrate all of them + servers + mass storage

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

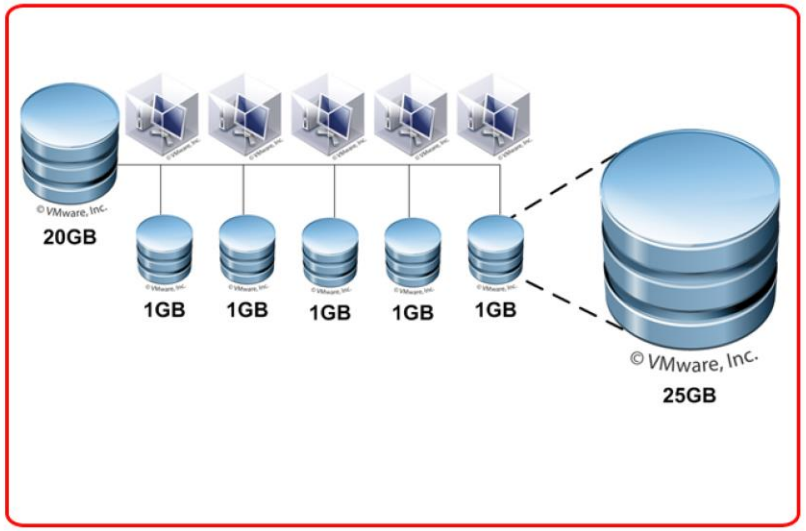
Benefits for student's labs– gold image



Link clones - technology



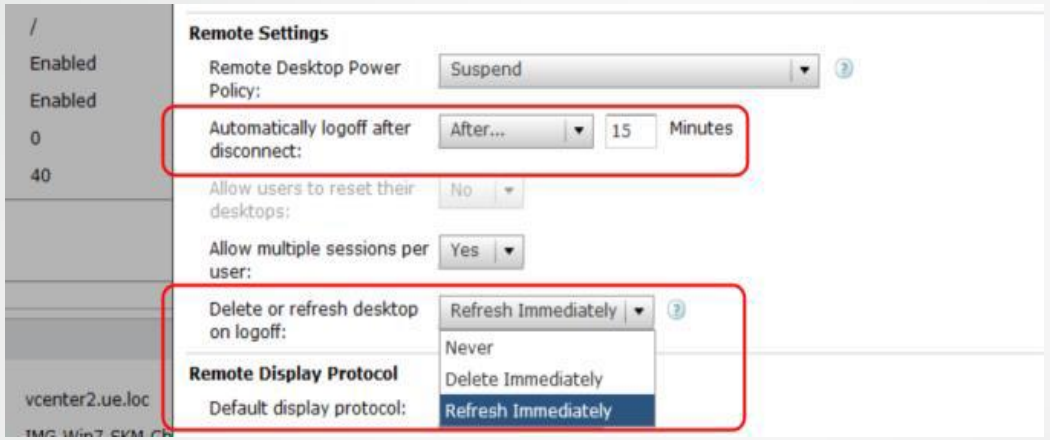
Classic allocation of virtual disks



Technique "Gold Image" and "Linked Clone"

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



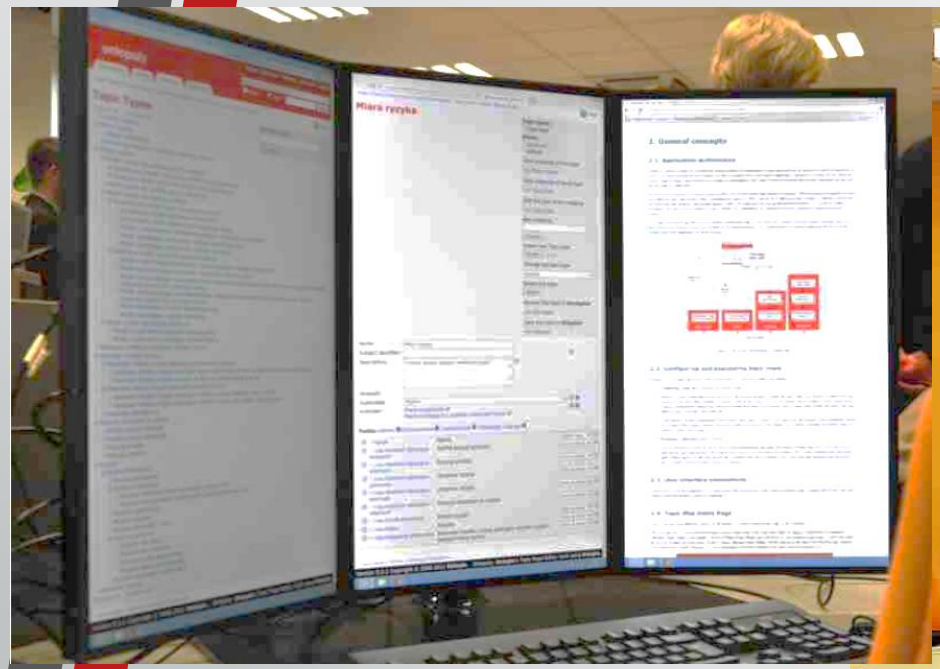
Instant Refreshing virtual systems - one of the implications of the golden images is the fact that if a virtual

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

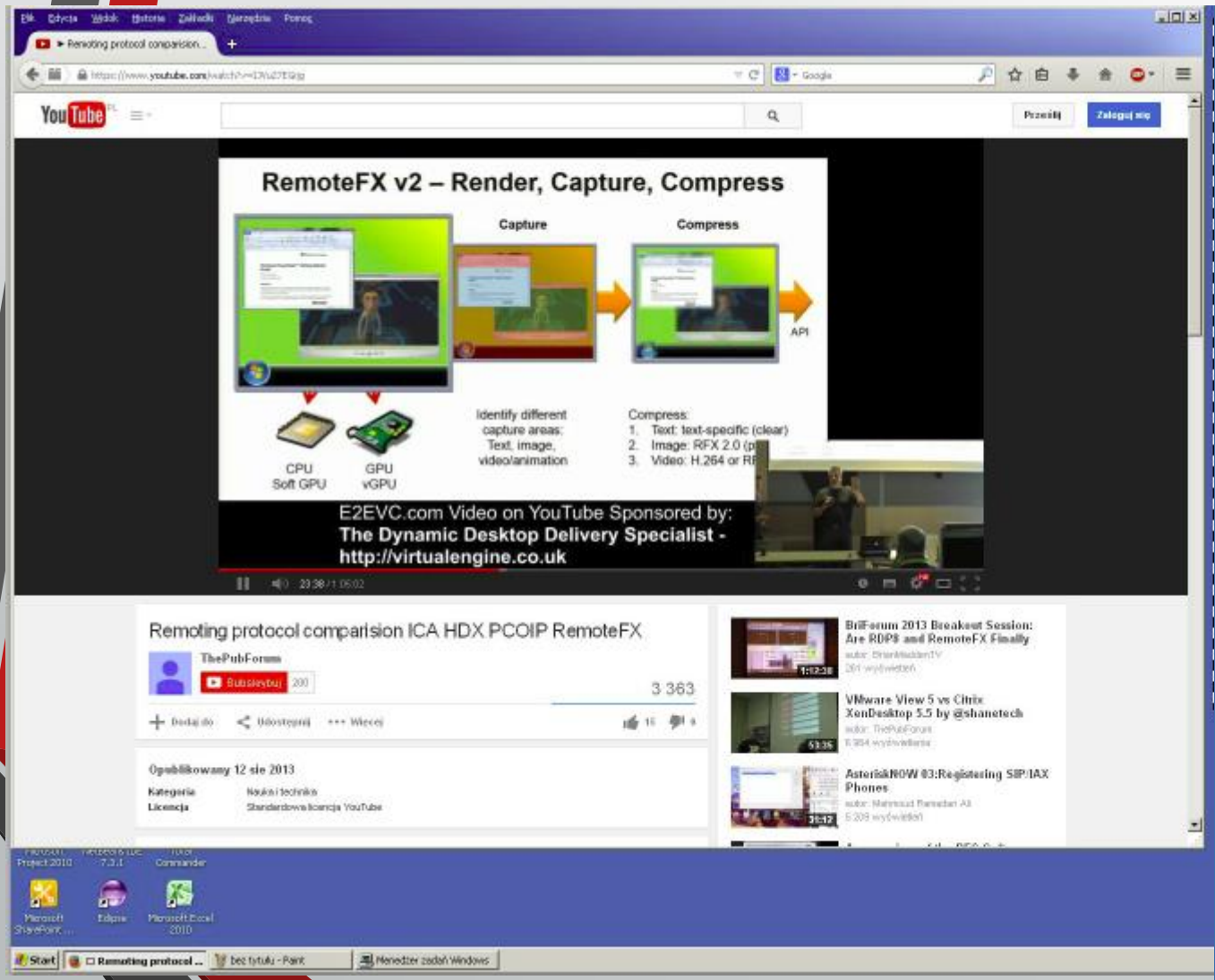
- 8 laboratories with ZERO CLIENT terminals
- 240 ZERO CLIENTS Worktations
- Over 356 virtual machines for students (7 versions of systems for different classes)
- Computing by SIX two-procesors blade server’s with 1,2 TB in summary
- Storage – 16 TB on hard disks with SSD cache

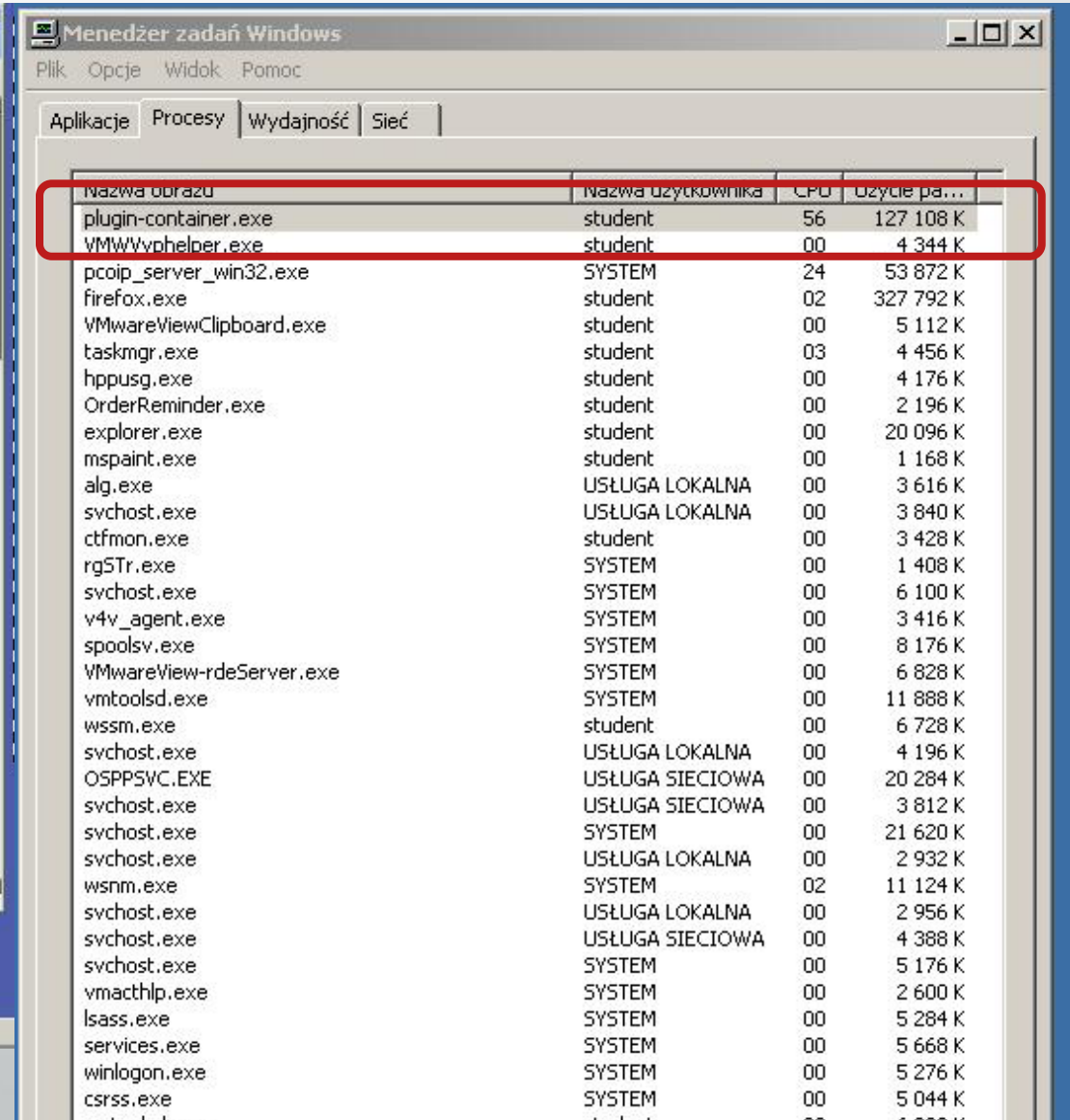
And dedicated laboratory



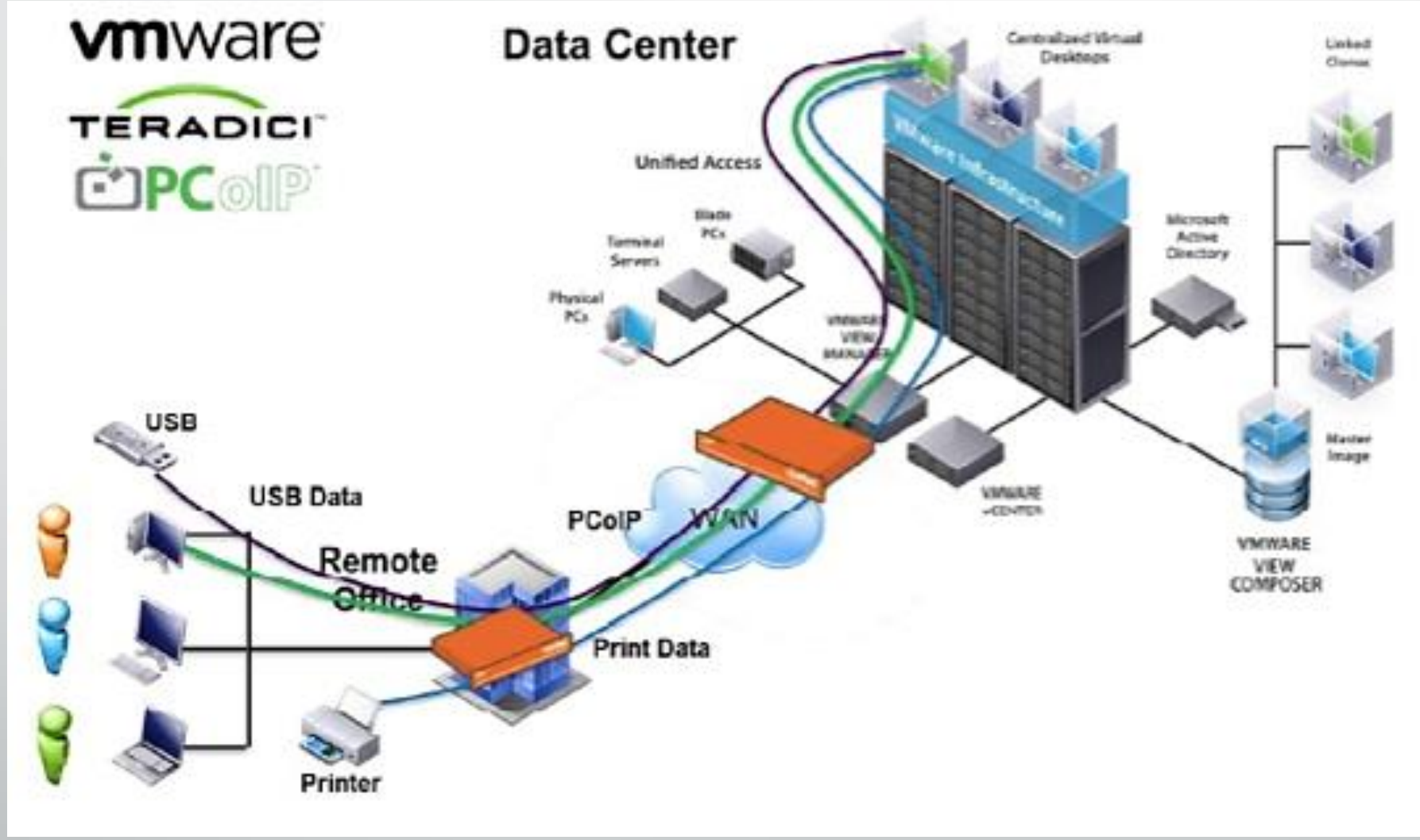
We started with Dell Blade's servers…
..but the blade's are not enought

The problems with PCoIP Protocol



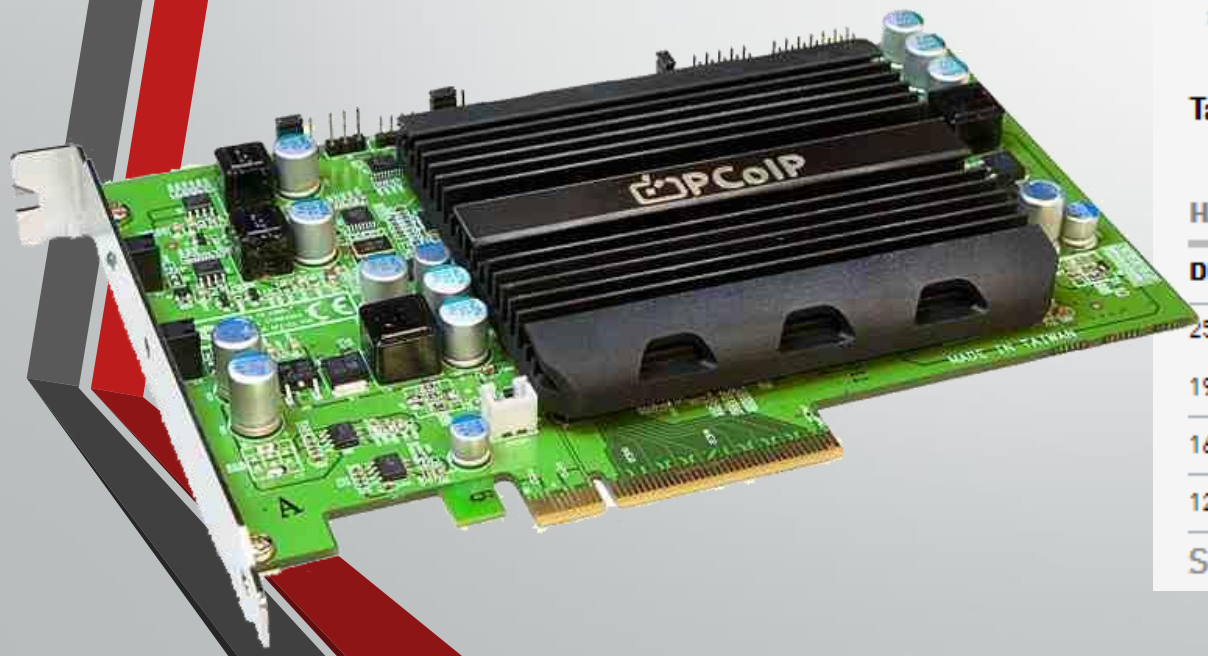


Because we need to encode the PCoIP stream



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

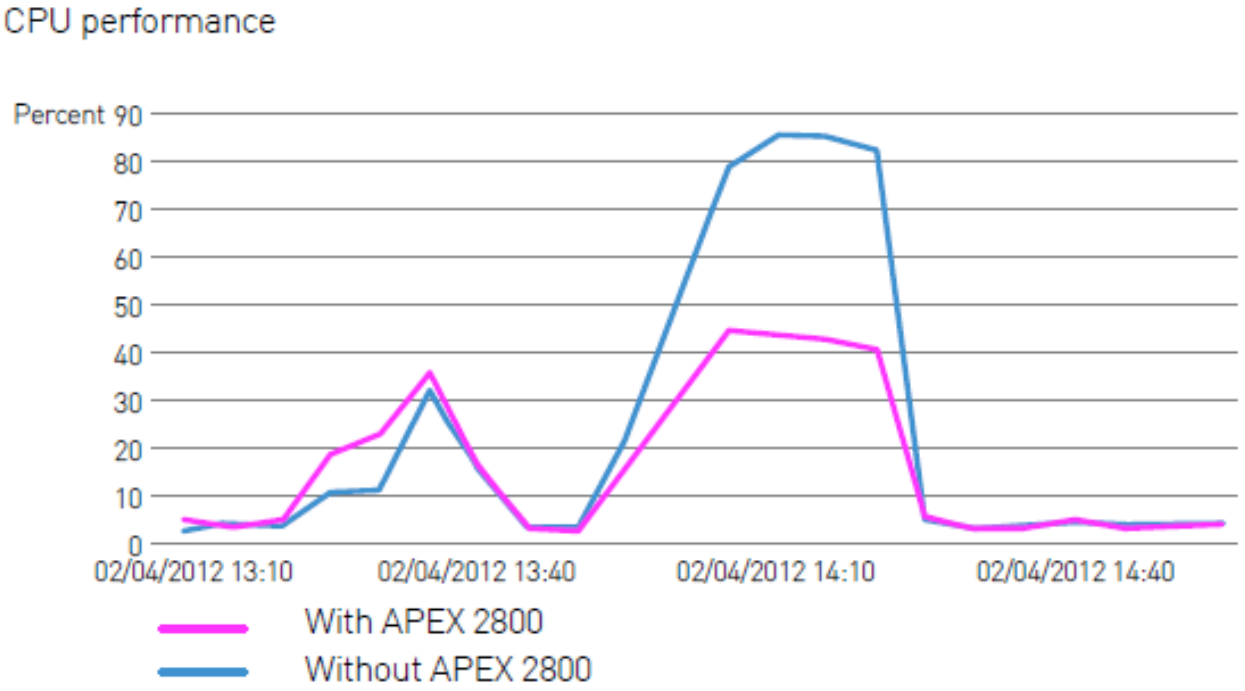
DISPLAY RESOLUTION	PORTRAIT MODE	LANDSCAPE MODE
2560x1600	25	40
1920x1200	40	64
1680x1050	50	85
1280x1024	100	100

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.



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 enought 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

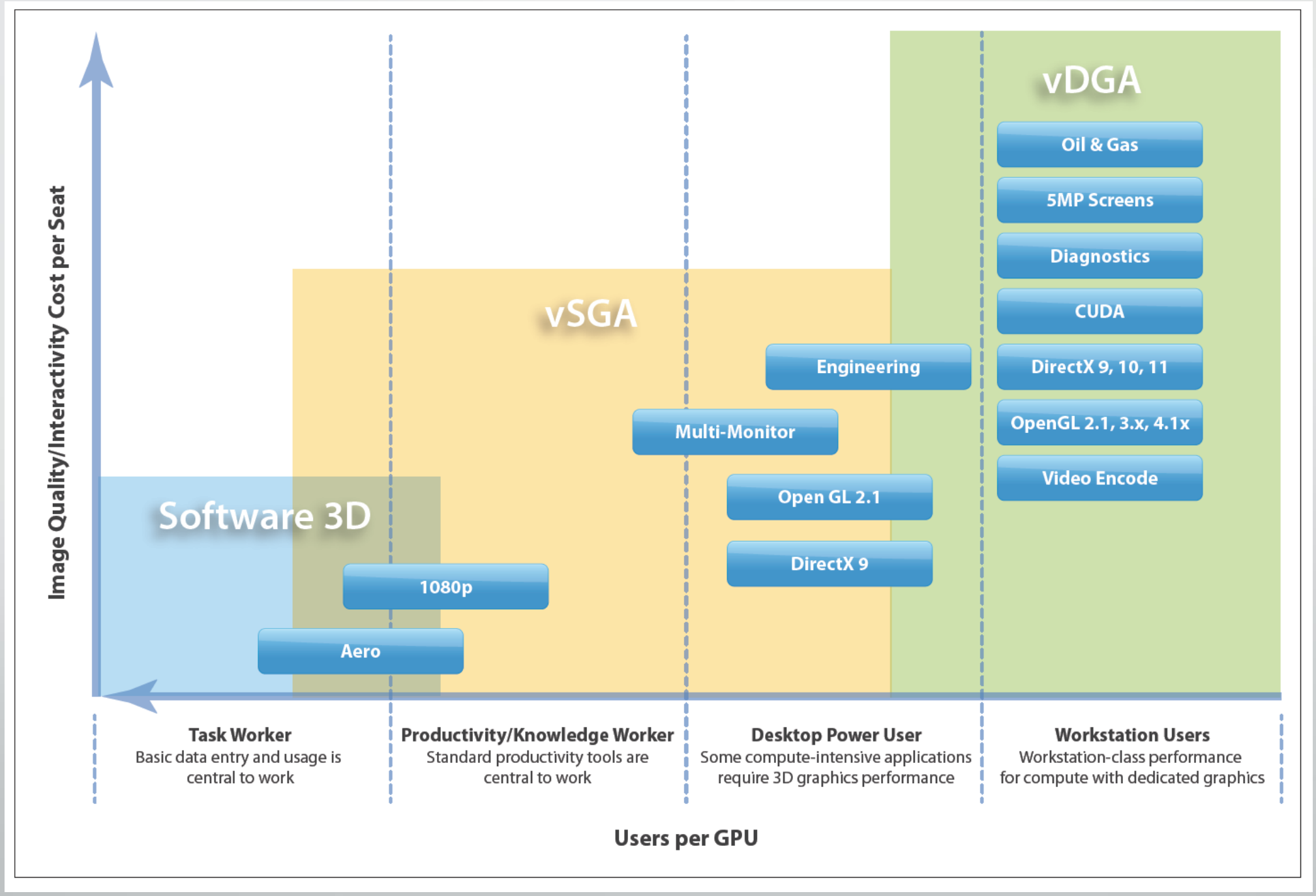


Image Quality/Interactivity Cost per Seat
vDGA
Oil & Gas
5MP Screens
Diagnostics
CUDA
DirectX 9, 10, 11
OpenGL 2.1, 3.x, 4.1x
Video Encode
vSGA
Engineering
Multi-Monitor
Open GL 2.1
DirectX 9
Software 3D
1080p
Aero
Task Worker
Basic data entry and usage is central to work
Productivity/Knowledge Worker
Standard productivity tools are central to work
Desktop Power User
Some compute-intensive applications require 3D graphics performance
Workstation Users
Workstation-class performance for compute with dedicated graphics
Users per GPU

How to put the card inside blade server ??

GRID CERTIFIED SERVERS

Download the GRID OEM Solutions Guide here

CISCO

Cisco UCS C460 M4	up to 2 GRID K1 or 2 GRID K2
Cisco UCS C240 M3	up to 2 GRID K1 or 2 GRID K2

DELL

Special Dell Trial Offer - North America.

Dell PowerEdge R720	up to 2 GRID K1 or 2 GRID K2
Dell PowerEdge T620	up to 3 GRID K2
Dell PowerEdge VRTX	up to 1 GRID K2
Dell PowerEdge C8220X	up to 2 GRID K2
Dell Precision R7610	up to 3 GRID K2

FUJITSU

FUJITSU CELSIUS C620	up to 1 GRID K2
FUJITSU CELSIUS R930	up to 2 GRID K1 or 3 GRID K2
FUJITSU PRIMERGY CX270 S2	up to 1 GRID K1 or 1 GRID K2
FUJITSU PRIMERGY RX350 S8	up to 2 GRID K1 or 2 GRID K2
FUJITSU PRIMERGY TX300 S8	up to 2 GRID K1 or 2 GRID K2

hp

Special HP Trial Offer - North America.

HP DL380Z Gen8 Virtual Workstation	up to 2 GRID K2
HP ProLiant DL380p Gen8	up to 2 GRID K1 or 2 GRID K2
HP ProLiant DL580 Gen8	up to 5 GRID K2
HP ProLiant WS460c Gen8	up to 1 GRID K1 or 1 GRID K2
HP ProLiant SL250s Gen8	up to 3 GRID K2
HP ProLiant SL270s Gen8 SE	up to 4 GRID K2

IBM

IBM NeXtScale nx360 M4	up to 2 GRID K1 or 2 GRID K2
IBM iDataPlex dx360 M4	up to 2 GRID K1 or 2 GRID K2
IBM Flex System	up to 1 GRID K1 or 1 GRID K2

lenovo FOR THOSE WHO DO.

Lenovo ThinkStation C30	up to 1 GRID K2
Lenovo ThinkStation D30	up to 2 GRID K2
Lenovo ThinkStation S30	up to 1 GRID K2

So before buying server check if you can use this card

Thank you

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