IBM Systems & Technology Group

The Virtual Client

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Chris De Vere
deverec@uk.ibm.com
07718 763293

Why now for the Virtual Client?

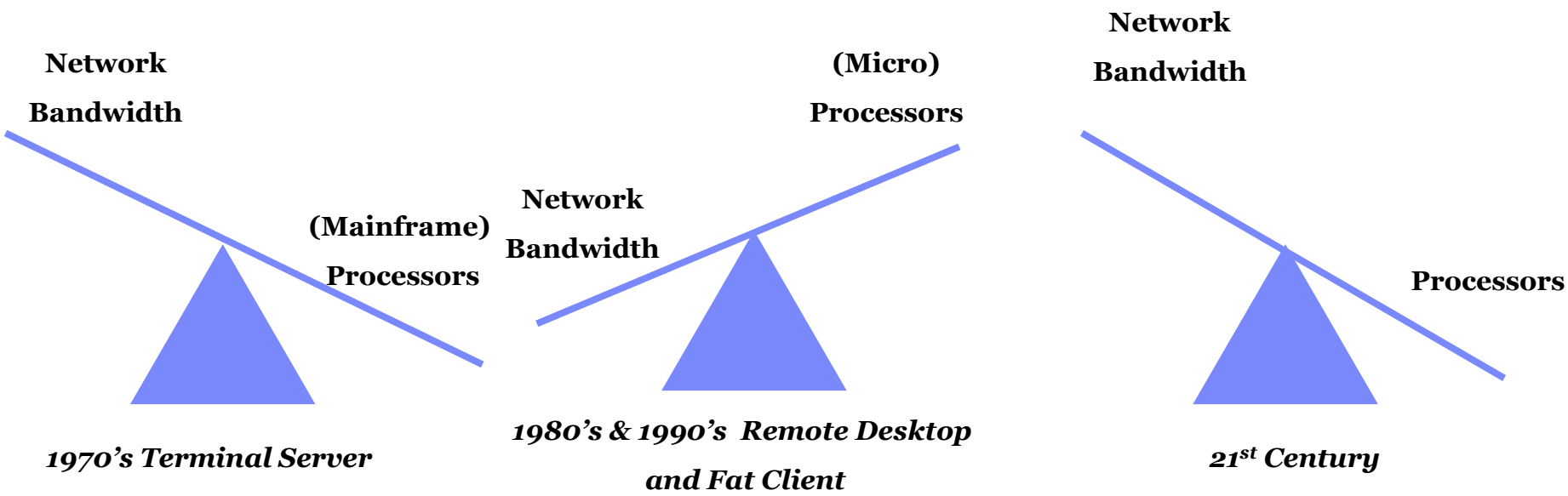
Life before Google, Wikipedia, and Amazon

The day the Internet Revolution started:
Wednesday, August 9, 1995

"..a 16-month-old Silicon Valley start-up called Netscape went public, but demand for the shares was so high that for almost two hours that morning, trading couldn't open. The stock, which had been priced at $28 a share, zoomed as high as $75 that day and closed at $58."

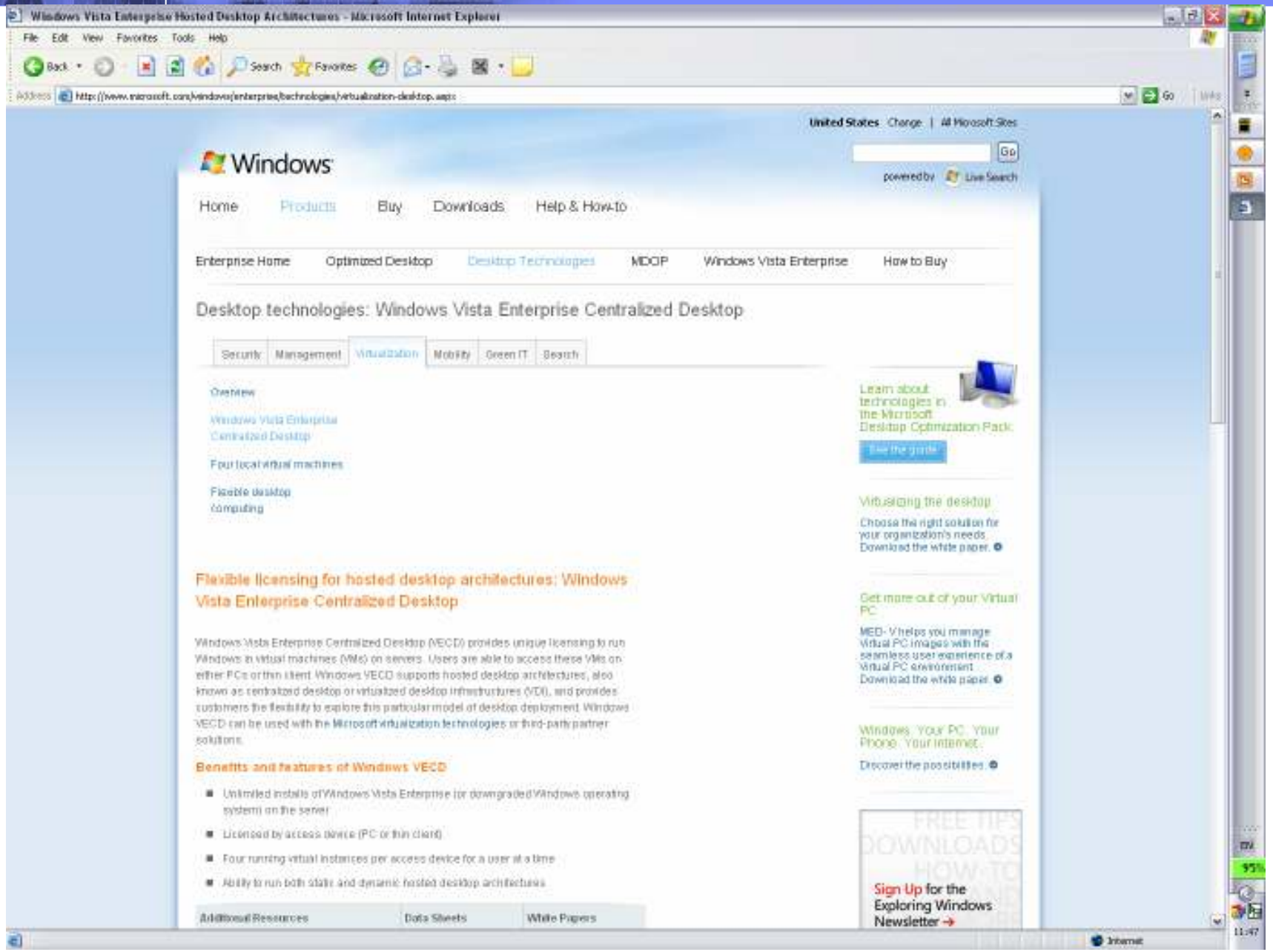
Inhibitors:
1. Bandwidth
2. Formats: Word; Excel; Outlook
3. Inertia

Bandwidth v's Processing Power trade-off

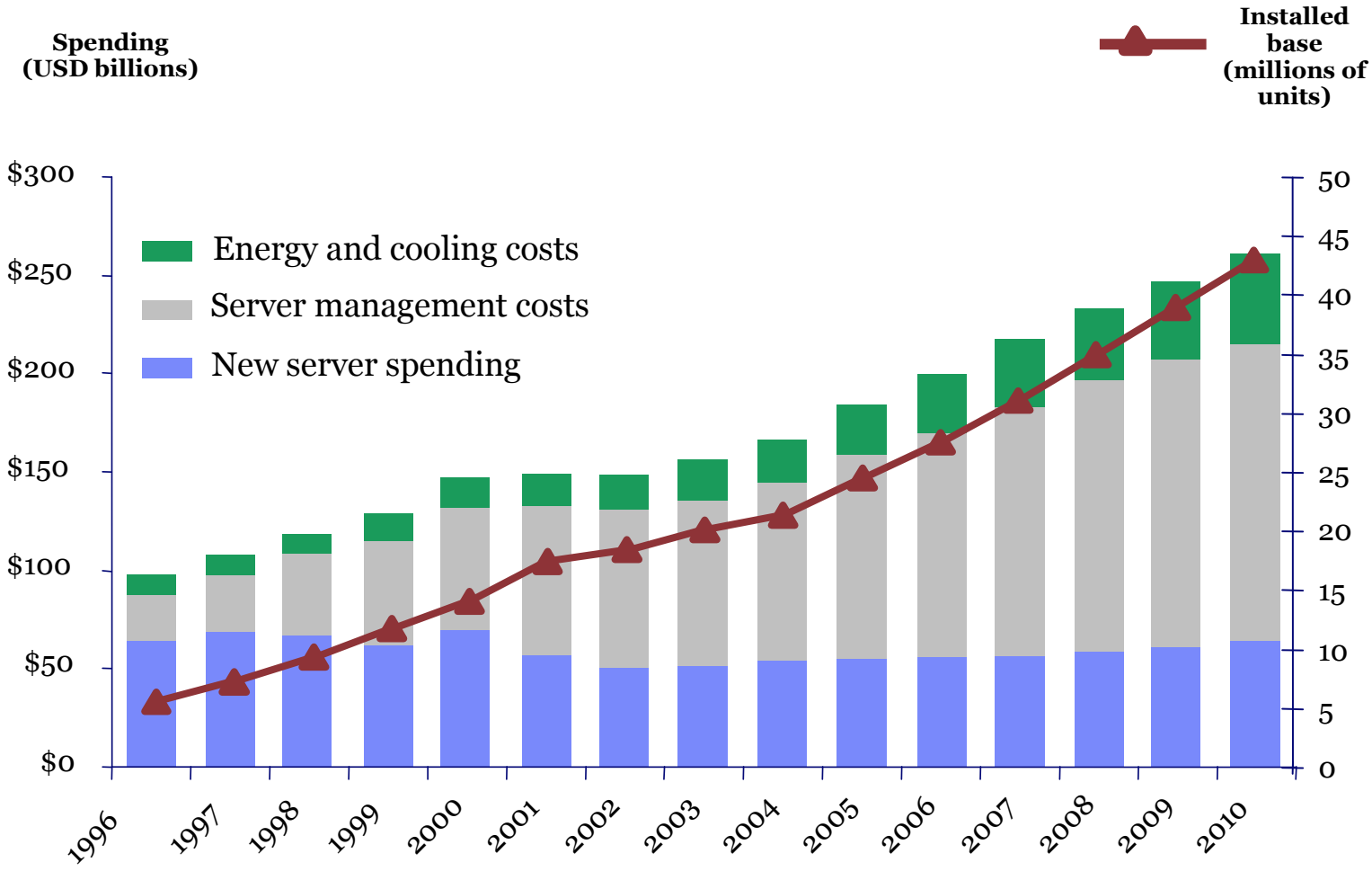


"The Telecosm" by George Gilder

Must imply a return to centralized computing.



Inertia



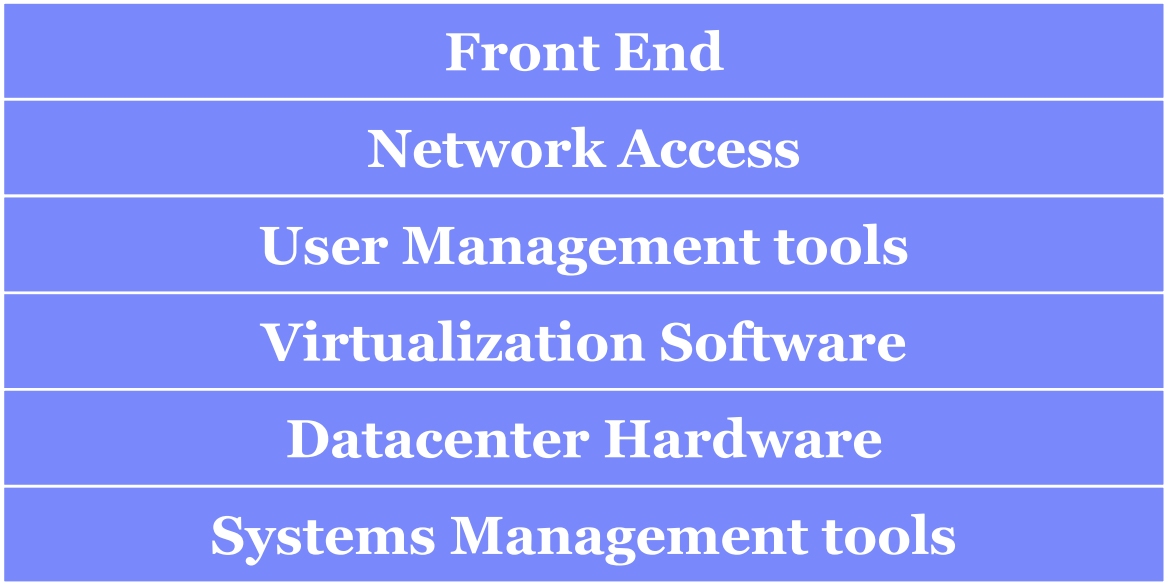
** Source: IDC, Worldwide Server Power and Cooling Expense 2006-2010 Forecast, Doc #203598, September 2006*

Inertia? What's the problem?

Mainframe utilization	**~80%**	80% of IT spend on maintaining current environment
Unix utilization	**~25%**	
		Reason = Complexity
x86 server utilization	**~ 5%**	
Desktop utilization	**< 1%**	But the Desktop consumes a huge proportion of the IT budget!

Which means that a huge proportion of IT spend is going on infrastructure that is hardly used at all!!

The 6 Layers of Virtual Client Solutions

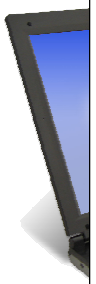


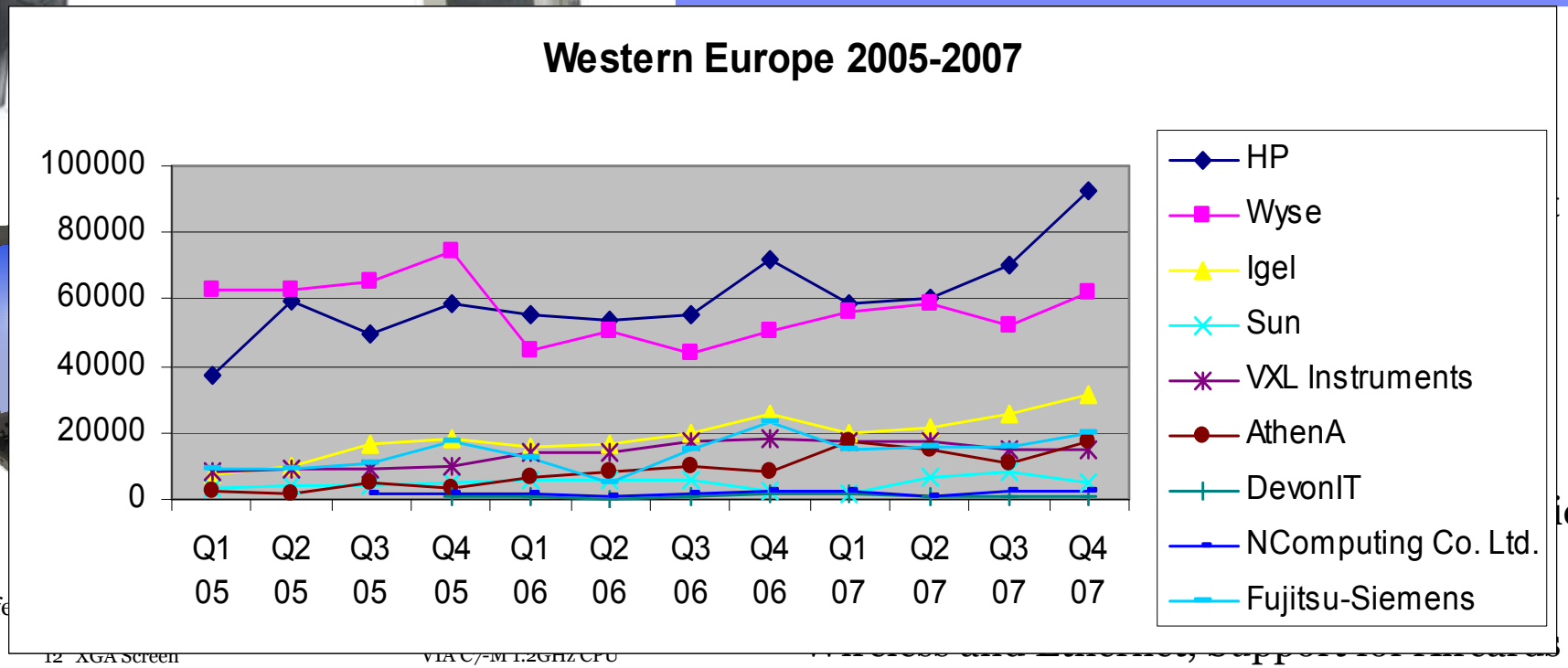
Thin Client Desktops & Notebooks

Low priced and full featured

- Front End
- Network Access
- User Management tools
- Virtualization Software
- Datacenter Hardware
- ystems Management too

IBM has alliances with the industry's leading thin client vendors





Safe

ice

12" XGA Screen
512MB Flash/512MB RAM
$799 list price, WinXPe
$599 list price, DeTOS

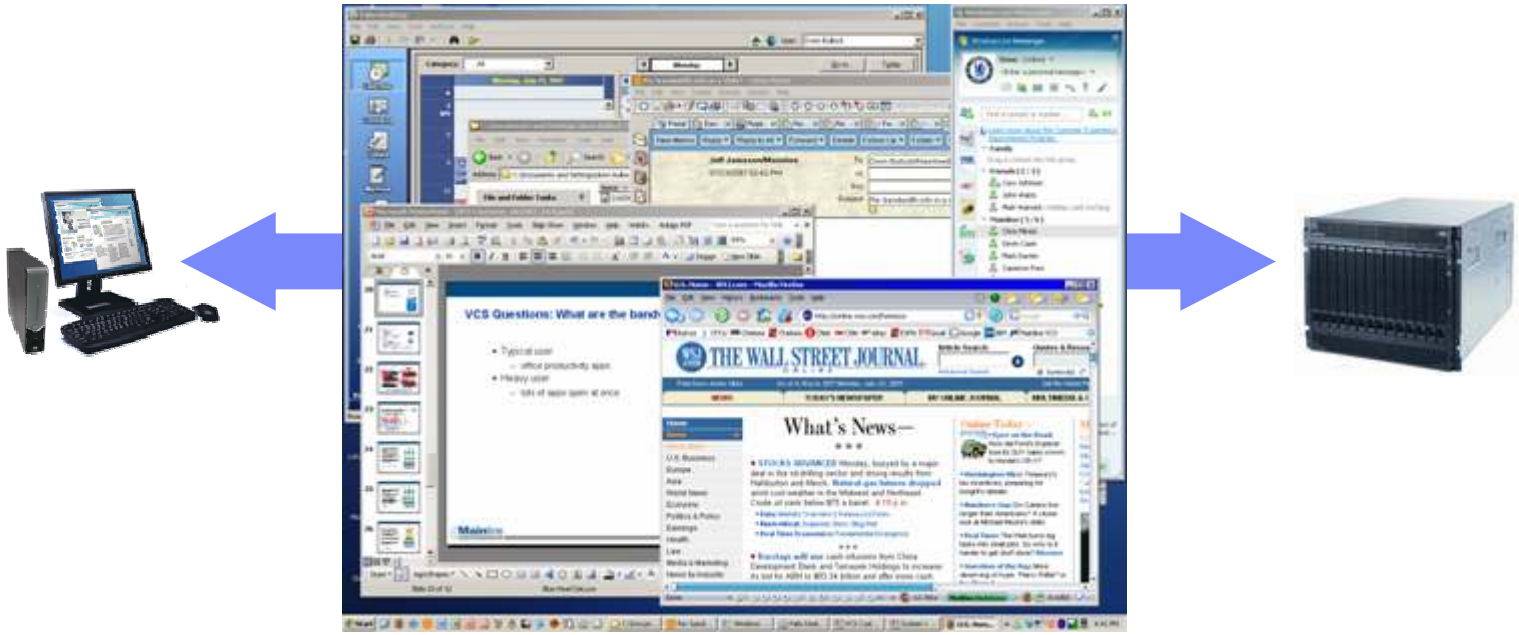
VIA C7-M 1.2GHz CPU
12" XGA Screen
512MB Flash/1512MB RAM
$599 list price x90
$679 list price x90e

–Bluetooth, smart card

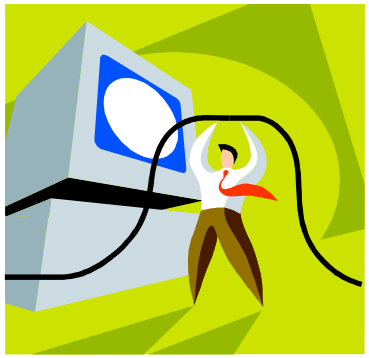
Network Access: Bandwidth requirements

- Typical user — 32-50 kbps per desktop*
  - office productivity apps
- Heavy user — 80-100 kbps per desktop*
  - lots of apps open at once

*Validated in real-world deployments, IBM and VMware lab testing



User Management tools: Market consolidation



thinstall

Xen Source™

LEOSTREAM

Microsoft®

Ardence

PROPERO

vmware

VirtualIron

CITRIX

dunes

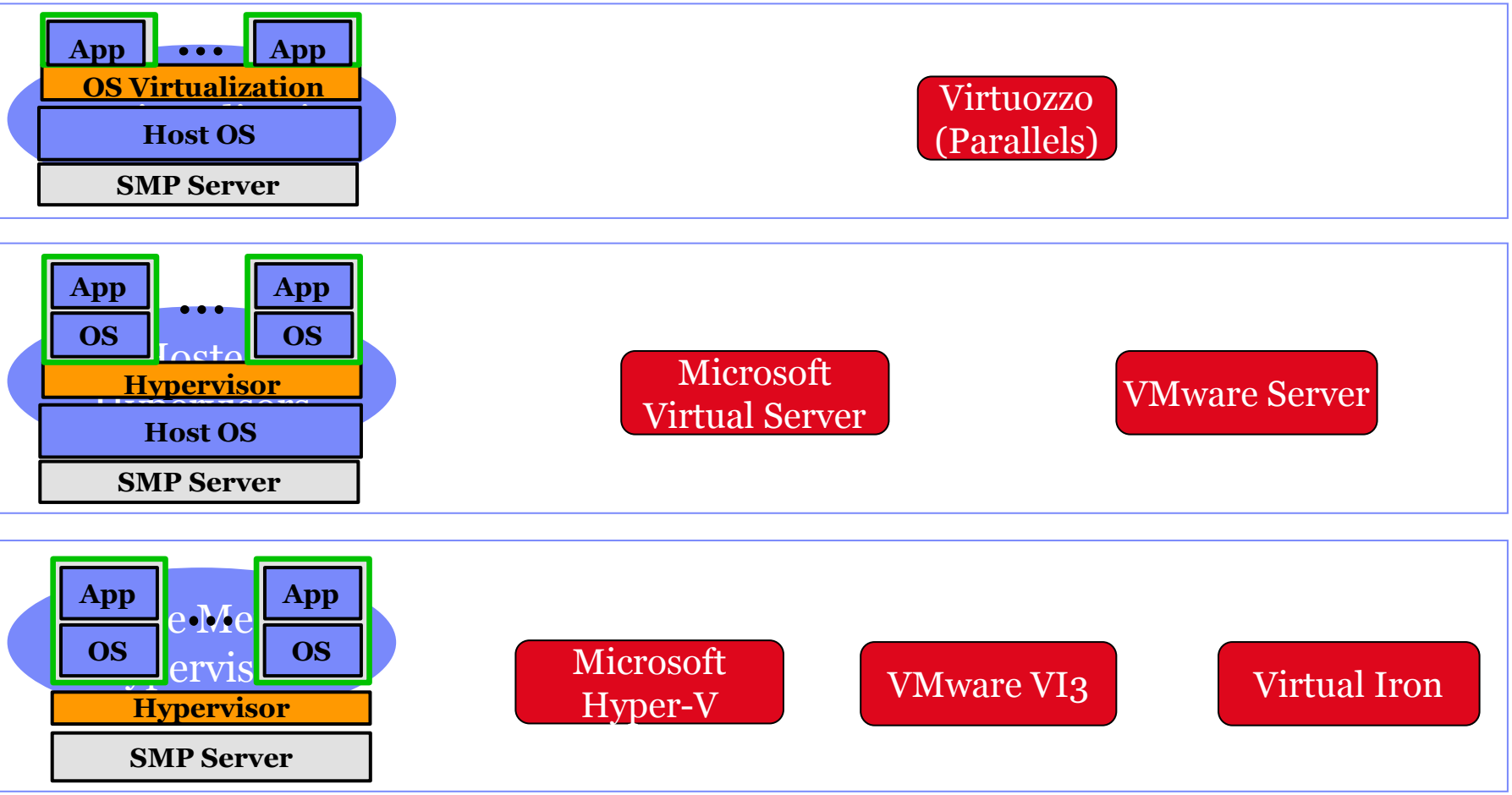
QUEST SOFTWARE

User Management Tools

- **Connection Broker**: Manages & eases integration of virtualization technologies among multi-vendor in the solution. VMware View; Citrix XenDesktop; Quest vWorkspace.
- **Remote Desktop Protocol (RDP):** Industry-standard for session monitoring and logging (or ICA from Citrix)
- **Active Directory or LDAP**: Provides Access Control & maintains user customizations/profile & License Management
- **Virtual Center/System Center/Provisioning Server**: Allows rapid VM provisioning, intelligently optimizes resources and ensures high availability to all applications in virtual machines
- **Application Virtualization:** Microsoft App-V; VMware Thin-App; Citrix Xen-App; Appsense; Intstall Free

Virtualisation Software

Architectures



Front End
Network Access
User Management tools
Virtualization Software
Datacenter Hardware
ystems Management too

IBM Hardware Platforms

Platform Flexibility, Industry-leading Performance & Reliability

BladeCenter

- HS21 XM:
- Intel Xeon Quad-core up to 3.0GHz, 1333MHz FSB, 16GB RAM, SSD

- BladeCenter E (7U x 14)
- BladeCenter H (9U x 14)
- BladeCenter S (7U x 6)

System x

- x3650: Intel Xeon Quad-core, up to 24GB RAM, 4TB Storage

- x3850 M2: Most VM-dense rack-based server
- X4: Enterprise X-Architecture
- Intel Xeon MP Quad-core, up to 128GB RAM

Storage

- DS3400: Most popular FC Storage
- Up to 48TB with 3 EXP3000 Expansion enclosures

- IBM Storage N series
- iSCSI SAN with FlexClone capability from NetApp

IBM x3850M2 Scale-Up Wins for Server Virtualization

Vers
Xeo
offe

- ✓ L
- ✓ L
- ✓ **Lowest Management Costs**
- ✓ **Highest Availability Attributes**

TecDem Ltd
Virtualisation Specialists

Consolidation Ratios for very heavily utilized Virtual Desktops: HP v's IBM

HP Blade 685	**25:1**
HP Blade 680	**27:1**
HP Proliant 580	**47:1**
IBM x3850 M2	**98:1**

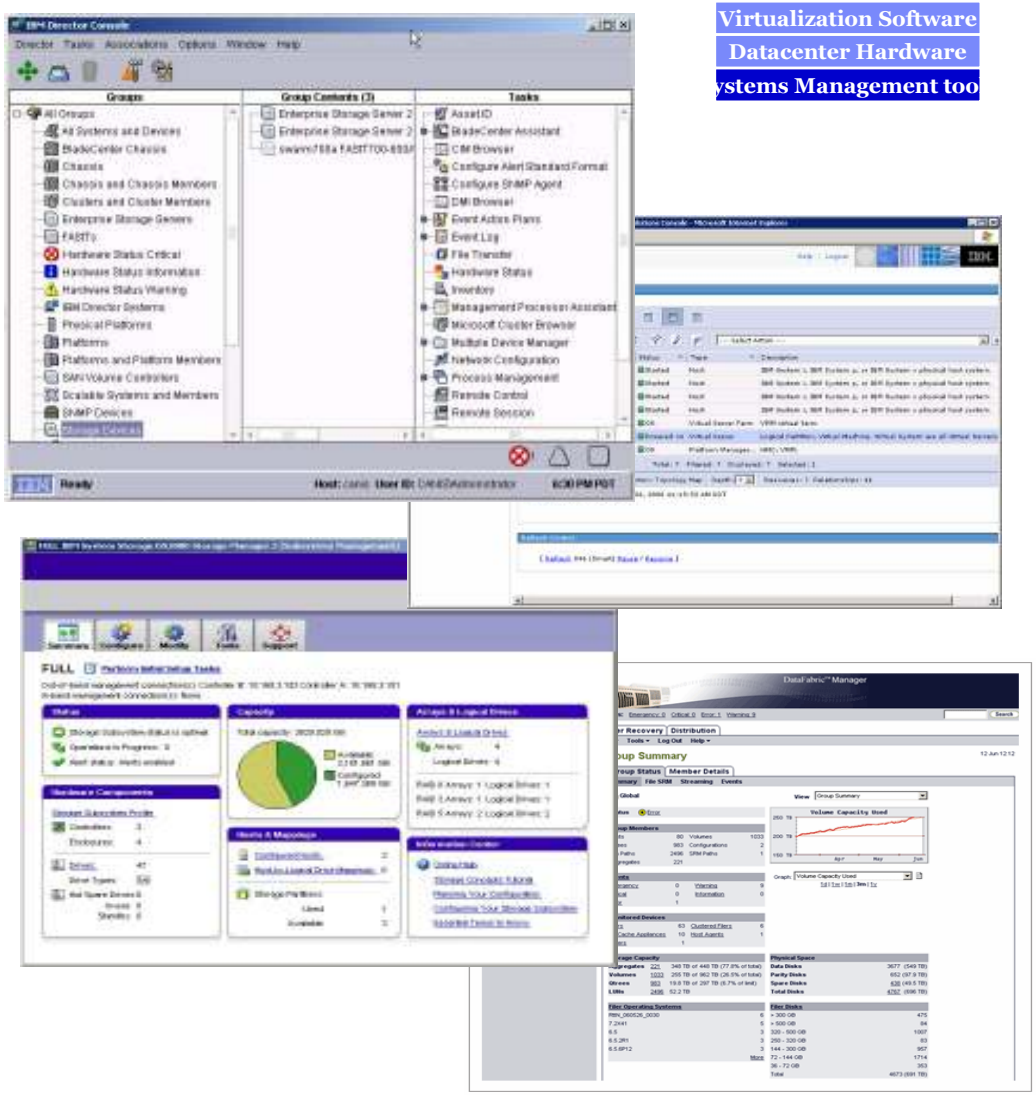
- And its GREEN....

67% less electricity than competition in a 4 socket (16 core) configuration

Systems Management tools:

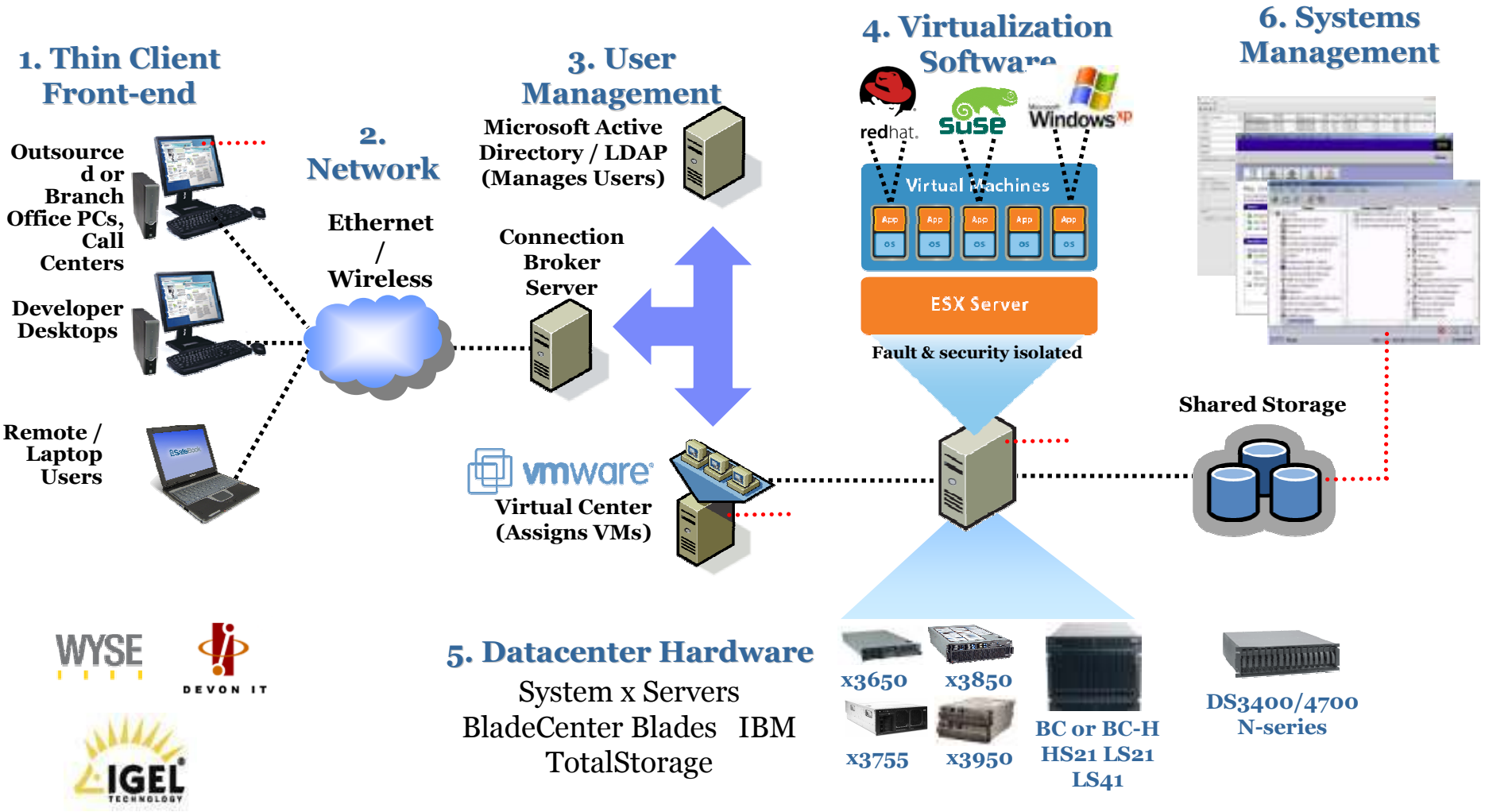
Front End
Network Access
User Management tools
Virtualization Software
Datacenter Hardware
ystems Management too

- IBM Director
  - –System Management software, integrated with embedded server hardware for failure alerts
- IBM Virtualization Manager
  - –Director's plug-in that integrates with VMWare Virtual Center for single console
- VMWare Virtual Center
- Microsoft System Center



The 6 Layers of a Virtual Client Solution

Virtualizing Desktops with a Server-hosted Architecture

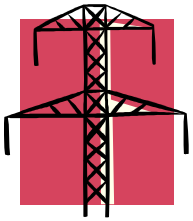


What are the benefits? Cost Savings

Server Models by Manufacturer		IBM x3850M2	HP - DL585	HP - DL580	HP - BL685c
Tecdem client consolidation ratio tests		98	60	47	25
Servers per 70000 client sessions		715	1167	1490	2800
Typical Outsource running costs					
Rack space		$1,430,000	$2,334,000	$2,980,000	$1,750,000
Medium server & Enhanced service		$10,725,000	$17,505,000	$22,350,000	$42,000,000
Standard Storage provision 8Gb per user		$5,040,000	$5,040,000	$5,040,000	$5,040,000
Annual Operating Costs not incl. electricity		$17,195,000	$24,879,000	$30,370,000	$48,790,000
Annual Cost per user		$246	$355	$434	$697
Note ***Environmentals					
rack space needed - U's		2860	4668	5960	3500
Standard 42U Racks needed		69	112	142	84
Annual KWhr run rate		6,564,043	10,233,143	16,942,015	16,945,782
Annual Server Electrical cost @ £0.10 per KWhr		£656,404	£1,023,314	£1,694,202	£1,694,578
Tonnes of C02		2823	4401	7286	7,287
Tonnes of carbon		771	1201	1988	1,989

(4 hours per PC to less than 2 hours per thin client)

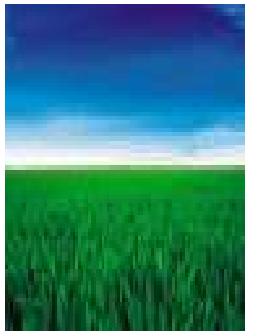
What are the benefits? Power savings



Client Consolidation uses much less power than traditional desktop deployments

- e.g. Assume 200 users
  - **Traditional desktop power consumption:**
    200 users @ average 150 watts per PC = **30,000 watts**
  - **Client Consolidation power consumption:**
    (2 x 3850 @640 watts) + (200 thin clients @ 20 watts) = 1,280 + 4,000 = 5,280 watts
  - **Cost savings are estimated at 124 watts per desktop**
  - **Average Desktop today = 200Kg CO_2 per annum**

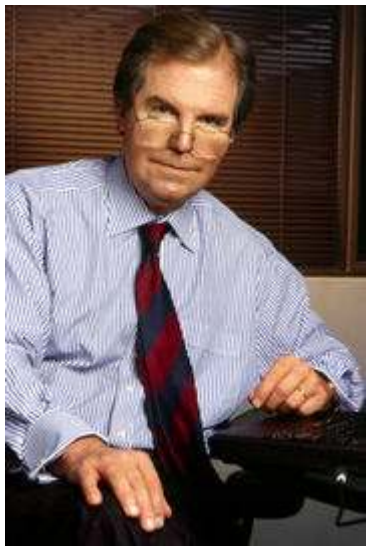
Estimated power savings of :
£12,000 per year for 200 users
£60 per PC per year!
(assumes 8 pence per KW hour price for electricity and 24 hour power on – UK figures)



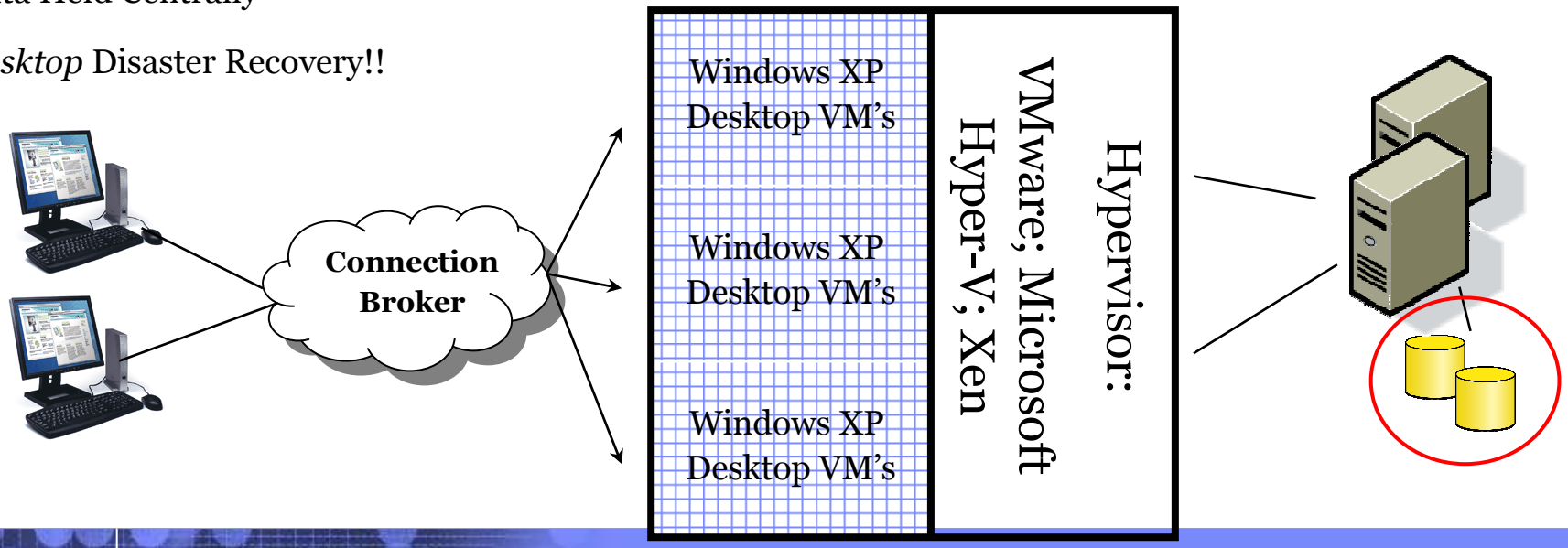
What are the benefits? Security

Nicholas Negreponte

- MIT's Medialab
- Book - *Being Digital* – "Move bits, not atoms!"
- First backer of "Wired" magazine
- $100 PC for Africa
- $10m laptop



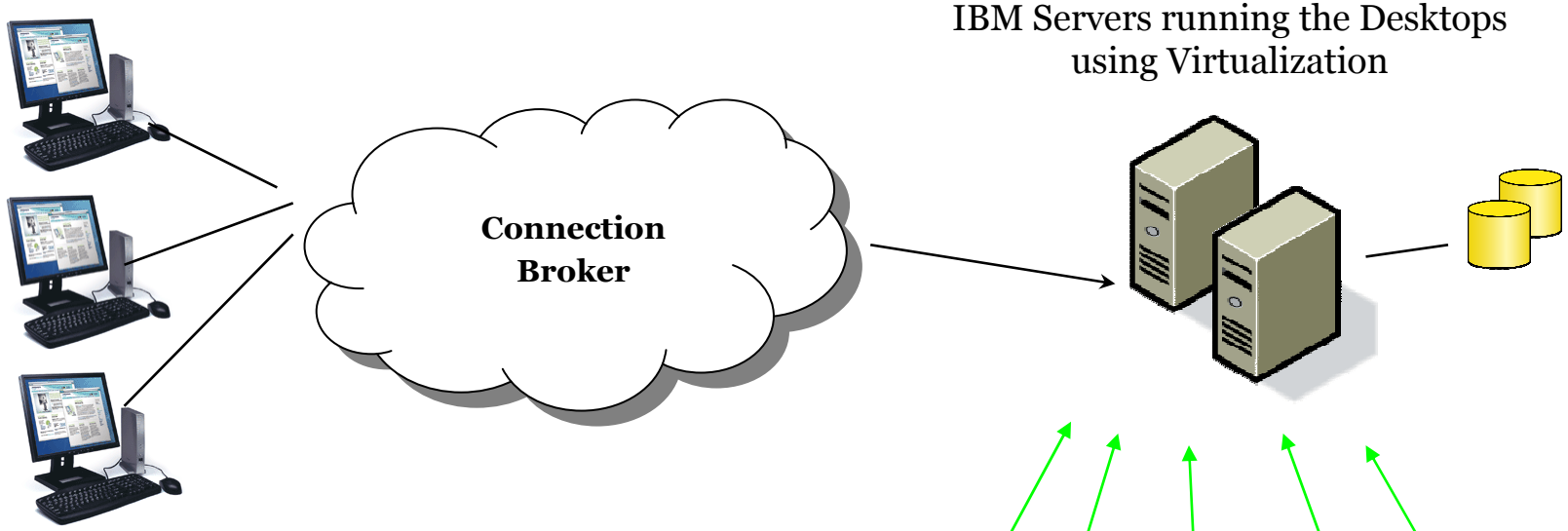
- Severe financial penalties for lost data
- Data Held Centrally
- *Desktop* Disaster Recovery!!

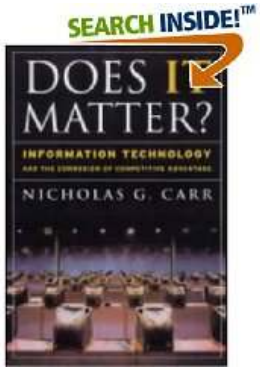


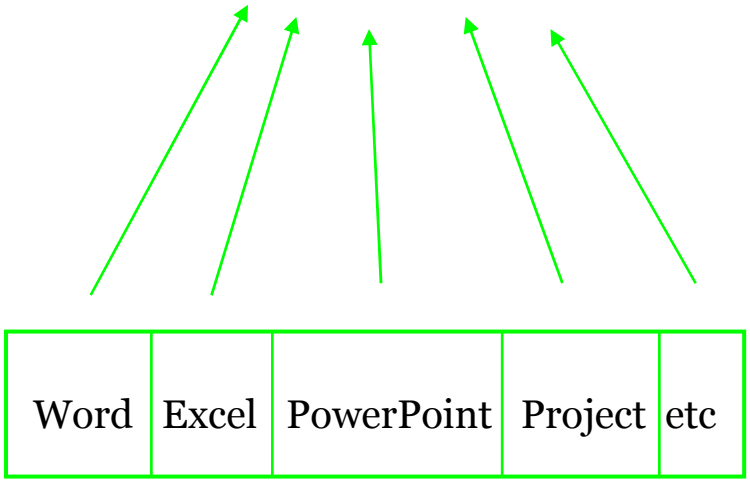
What are the benefits? Business Agility

Thin Clients

IBM Servers running the Desktops using Virtualization







Application Virtualization

What are the concerns?

Virtualization = Fewer, bigger servers

…and you will be putting all your eggs in a few baskets!

"Concentrate your energies, your thoughts and your capital. The wise man puts all his eggs in one basket and watches the basket.

Andrew Carnegie

But, one company has pioneered this all your eggs in one basket approach: IBM with the mainframe.

"The Mainframe never fails!"

R&D 5 from 1

The mo

Redundant I/O Links

The two PCI-E controllers have redu
link fails the redundant path will be t
the servers extremely reliable and mi

Memory ProteXion

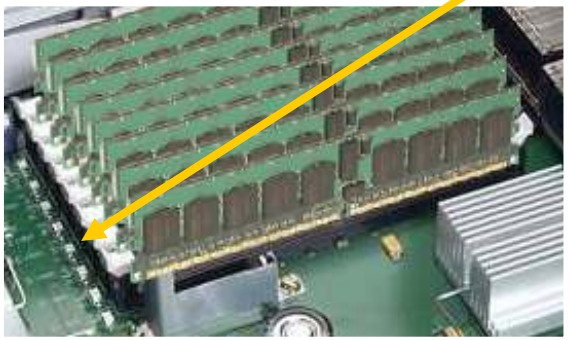
The Memory ProteXion feature, is s
can fail, and the system will autom
spare' drive online. With Memory
on a standard DIMM – another adv
5 array), we automatically use the s

t spare disk. In a RAID 5 array, one drive
sing drive on the fly, and can bring the 'hot
"spare" RAID drive – as we use excess bits
M fails (similar to a drive failing in a RAID
ng a hot-spare drive

Hot Swap and Hot Ad

Hot swap and hot add components
Fans, Memory, PCI-E Adapters an

repairs are carried out. You can swap out
running.



Analysis

the ground floor of a building. The Fire alarm panel will indicate which floor,
-so that fire fighters can reach and execute their operations faster. They know
ostics works like a fire alarm panel which not only warns of a "fire", but will
so that necessary action can be taken without any time delay keeping the system
Predictive Failure Analysis (PFV) many components will also alert the system if
n be taken before an actual failure.

Systems Management

IBM Systems Director

With IBM Director, you can view and track the hardware configuration of remote systems in detail and monitor the usage and performance of critical components, such as processors, disks and memory. IBM Director is provided at no additional charge for use on IBM Systems.

IBM Director does, and HP and Dell does not do the following:

1. IBM Director manages IBM and other x86 Servers
2. IBM Director manages other IBM servers and SNMP devices
3. If a critical change to the server inventory occurs, IBM Director notifies administrator.
4. IBM Director has many more hardware monitors than the competition.
5. IBM Director enables you to use a single management console, regardless of hardware vendor.

Virtualization Manager

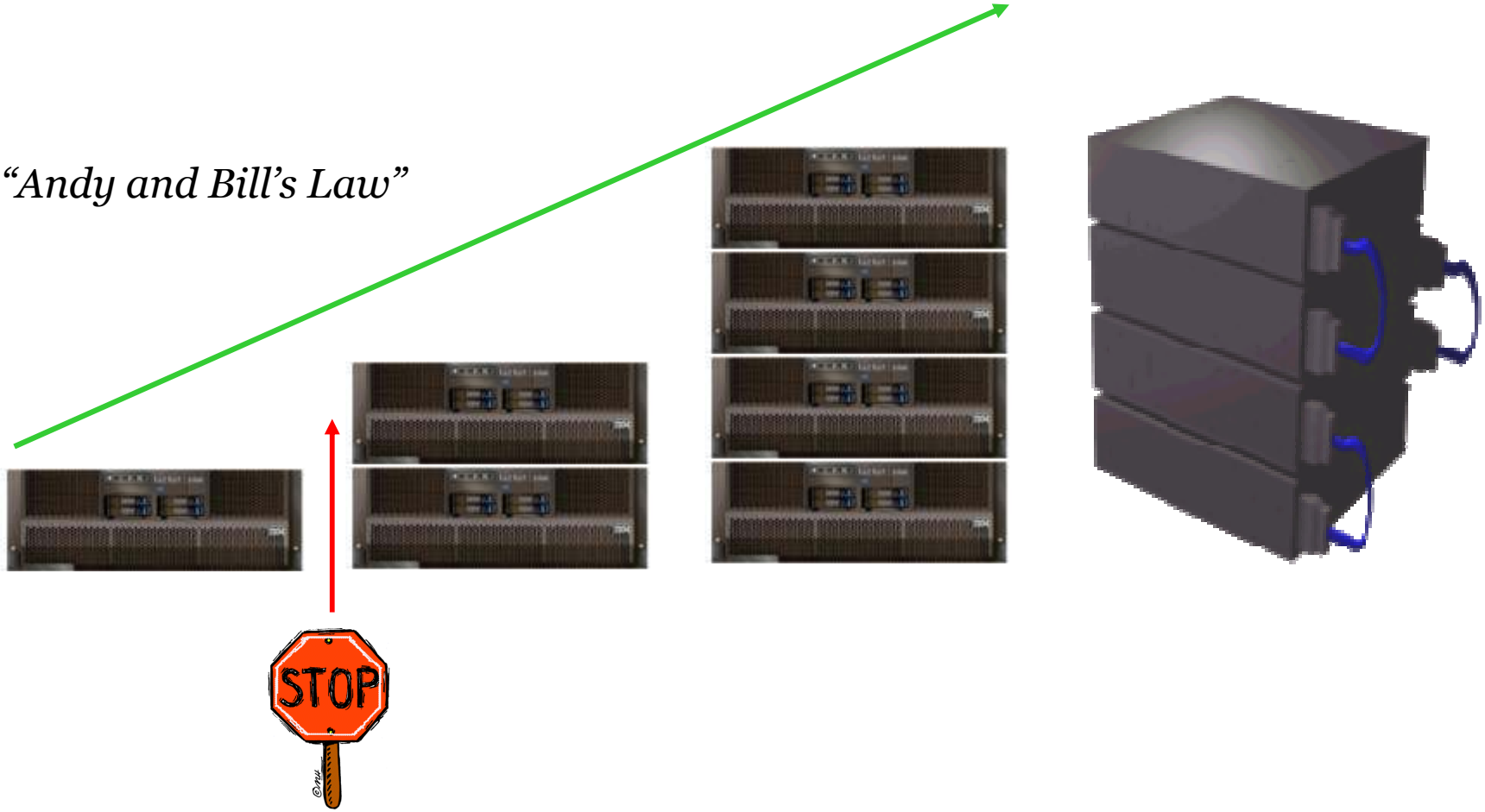
Virtualization Manager simplifies management of VMware, Xen, Microsoft® and POWER based Virtual Server environments. Virtualization Manager also integrates with and complements VMware VirtualCenter, linking together management for physical and virtual resources.

1. Base Virtualization manager with no additional cost unlike HP
2. Allows you to migrate VM's based on PFA alerts or high resource utilization.
3. Manages Multiple Virtualization technologies and multiple IBM server platforms

An Intel Mainframe: 4 times bigger than the competition

(and grows from small to big)

"Andy and Bill's Law"



IBM Delivers #1 Benchmarks Across The Board

x3950 M2 8 Socket

- **IBM is first to break the barrier of 1 million transactions per minute on TPC-C benchmark—achieves industry milestone for x86-64 performance.**
  - IBM System x3950 M2 with the Intel Xeon Processor X7460 2.66GHz (8 processors/48 cores/48 threads),DB2 9.5 (64-bit) and Red Hat Linux Advanced Server 5.2, 1,200,632 tpmC, $1.99 USD / tpmC

- **IBM posts leadership 8-processor result on two-tier SAP SD Standard Application Benchmark**
  - 9,200 two-tier SAP SD Benchmark users, IBM System x3950 M2 was configured with eight Intel Xeon X7460 processors, 2.66GHz with 9MB L2 cache, (3MB per 2 cores) and 16MB L3 cache (8 processors/48 cores/48 threads), 128GB of memory, 64-bit DB2 9.5 and Microsoft Windows Server 2003 Datacenter, and SAP ERP 6.0

x3850 M2 4 Socket

- **IBM shatters all records for 4-processor server performance on the TPC-C benchmark**
  - IBM System x3850 M2 with the Intel Xeon Processor X7460 2.66GHz (4 processors/24 cores/24 threads), Microsoft® SQL Server 2005 Enterprise x64 Edition (SP2) and Microsoft Windows® Server 2003 R2,Enterprise x64 Edition (SP2), 684,508 tpmC, $2.58 USD / tpmC

- **IBM publishes world-record 4-processor performance and overall best price/performance on TPC-E benchmark**
  - IBM System x3850 M2 with the Intel Xeon Processor X7460 2.66GHz (4 processors/24 cores/24 threads), Microsoft SQL Server 2008 Enterprise x64 Edition and Microsoft Windows Server 2008 Enterprise x64, Edition, 729.65 tpsE, $457.27 USD / tpsE

- **IBM achieves leadership processor performance with Spec CPU2006 benchmarks**
  - IBM System x3850 M2 with the Intel® Xeon Processor X7460 2.66GHz (4 processors/24 cores/24 threads) and 64GB of memory, demonstrated leadership performance for a 4-socket x86 system on the SPECint_2006 (25.5) and SPECint_rate2006 (294) member of the SPEC CPU2006 benchmark suite. These results were achieved using SUSE Linux® Enterprise Server 10 x64 (SP2).

- **IBM achieves leadership Oracle E-Business Suite Payroll (Batch) Application score**
  - IBM® System x3850 M2 server processed 10,000 employee payroll batch update in 5.37 seconds (Wall Clock Duration) concurrent users on the Oracle® E-Business Applications 10g eBS benchmark for Applications Release 12. The highest score published to date for Intel® Xeon® 7400 processor-based servers and for servers using the Red Hat Enterprise Linux® operating system

Less power than the competition

Supplier Plate Ratings

IBM x3850M2 power supply rating = 1440W

HP DL580 G5 power supply rating = 2400W

1440/2400: IBM only consumes 60% of power required by HP!

Principled Technologies low workload test

4P IBM x3850 consumed **13% less** power than 4P HP DL580 G5

8P IBM x3950 consumed **19% less** power than 2 of the 4P HP DL580 G5

2009 is the year of x86 Virtualization

That leads us to a number of inter-related themes:

- The changing balance between network bandwidth and processing power
- PC utilization is negligible
- Huge proportion of the IT budget is consumed by the PC
- 80% of IT budget on keeping what is there running, only 20% on new projects
- Complexity = cost
- New Enterprise Data Centre
- Green – most of the energy consumed in IT is outside the data centre (i.e PC's)
- All roads seem to lead to The Virtual Client!

Virtualization implies Scale-Up to big servers, to an Intel Mainframe

Questions?