Cloud Expo Europe

Linux, Virtualization, and Clouds

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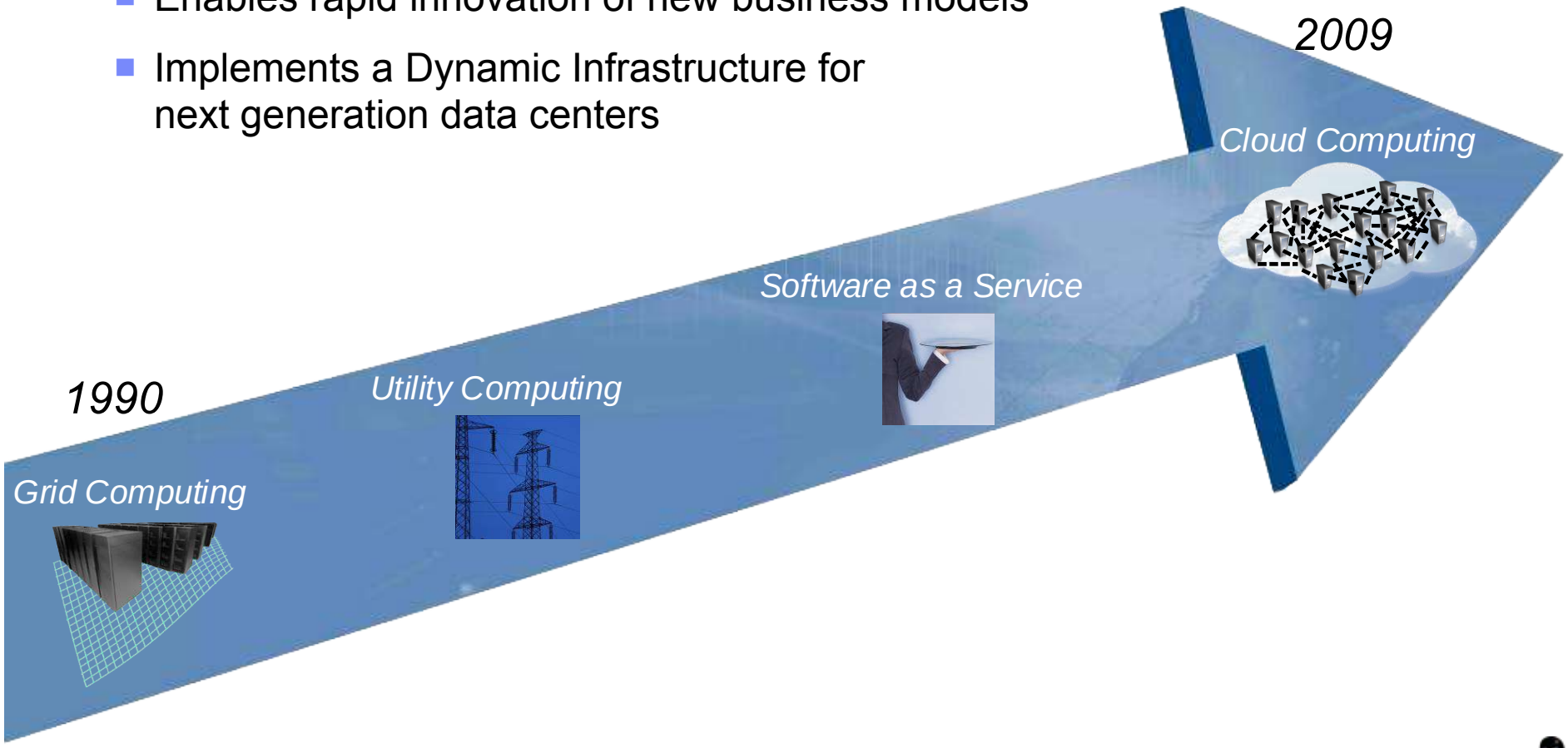
Virtualisation is a set of concepts and techniques that allow efficient implementations of clouds.

Linux is a particular operating system that both provides virtualisation and can itself be virtualised.

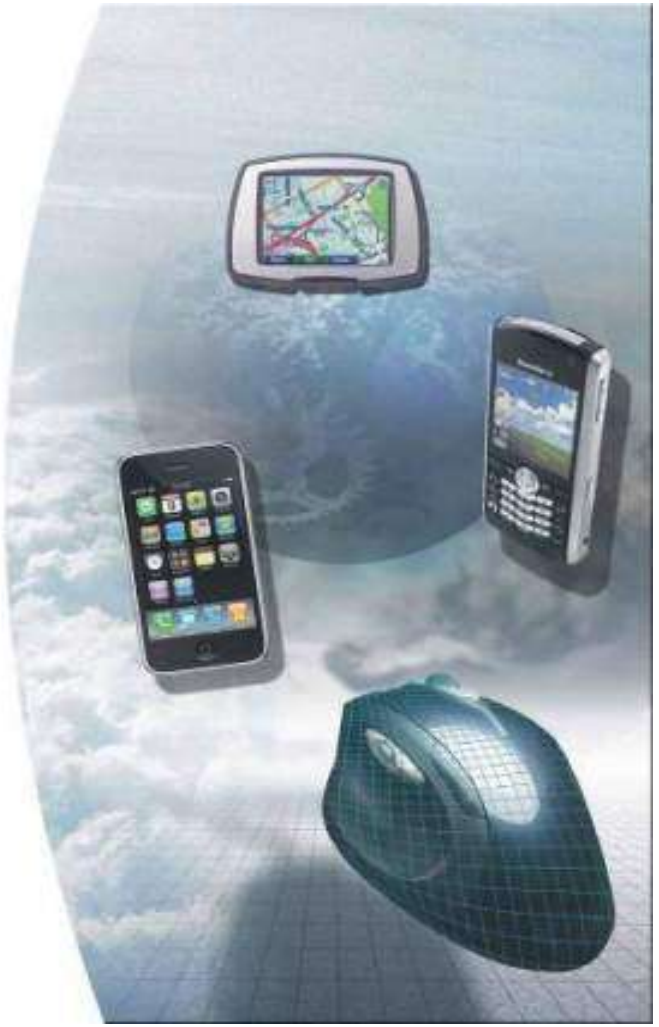
Cloud Computing: A "New" and Disruptive Idea

- Provides massively scalable computing resources from anywhere
- Simplifies services delivery
- Enables rapid innovation of new business models
- Implements a Dynamic Infrastructure for next generation data centers

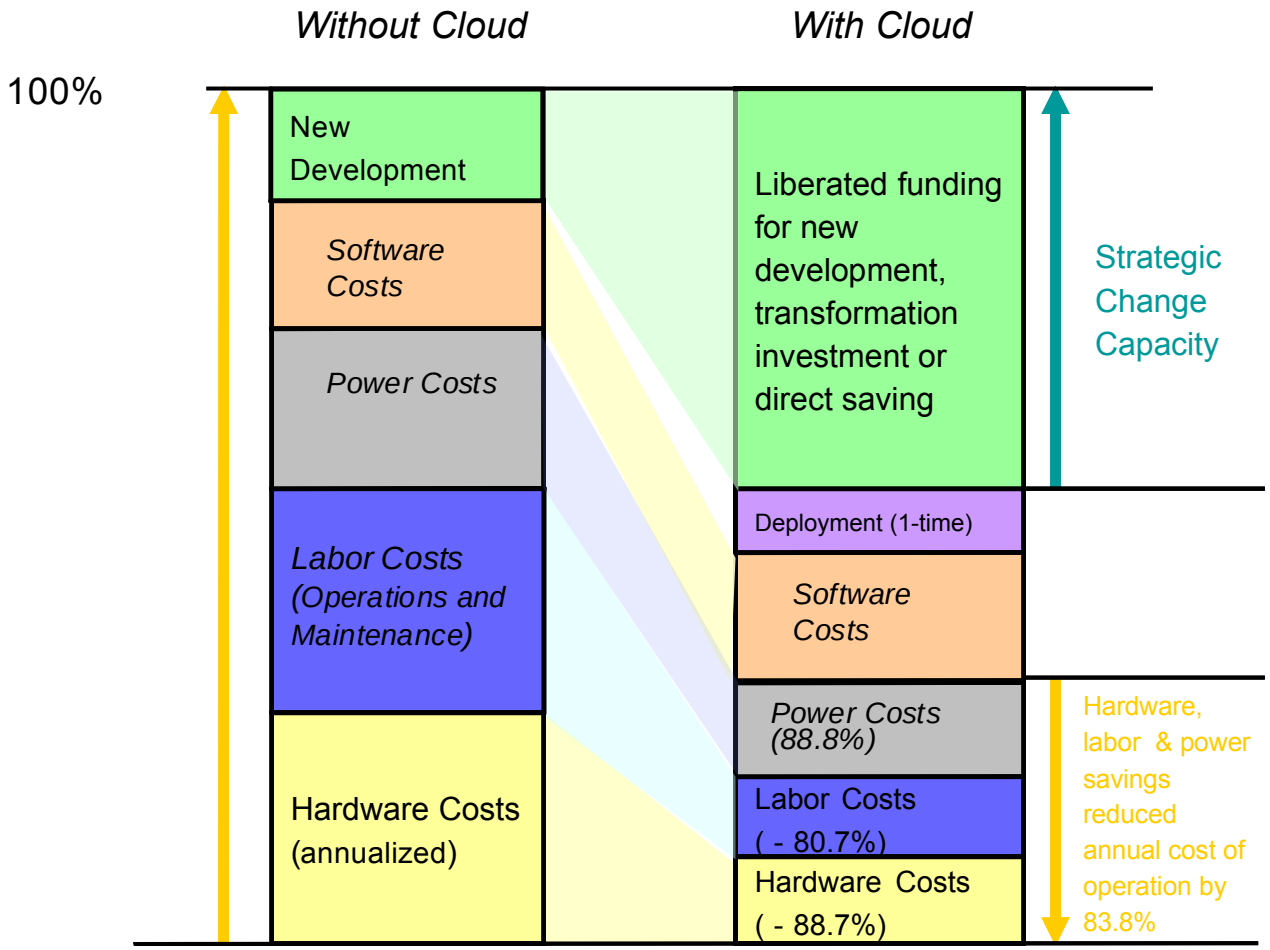


IBM's View of Cloud Computing

- **Business benefits**
  - Cost savings
  - Employee mobility
  - Speed and agility in delivering new solutions
- **IT benefits**
  - Allows IT to shift focus to business solutions instead of infrastructure
  - Grants economies of scale to the IT infrastructure
  - Is flexible in allowing use of private, public, and hybrid computing resources



An Internal IBM Example



IBM Blue Cloud – Announced in November, 2007

Apache hadoop eclipse

Virtual Machine | Virtual Machine | Virtual Machine | Virtual Machine

Tivoli Monitoring Agent

Linux with Xen

Virtualised Infrastructure Based on Linux & Xen

Cloud Computing Management Services

IBM System z, System p, System x, BladeCenter

Monitoring

Provisioning bare metal & virtual machines

IBM Tivoli. Monitoring v.6 | DB2 | Tivoli. Provisioning Manager v.5.1 | WebSphere. Application Server

Provisioning Management Stack

Based on open standards and open source software

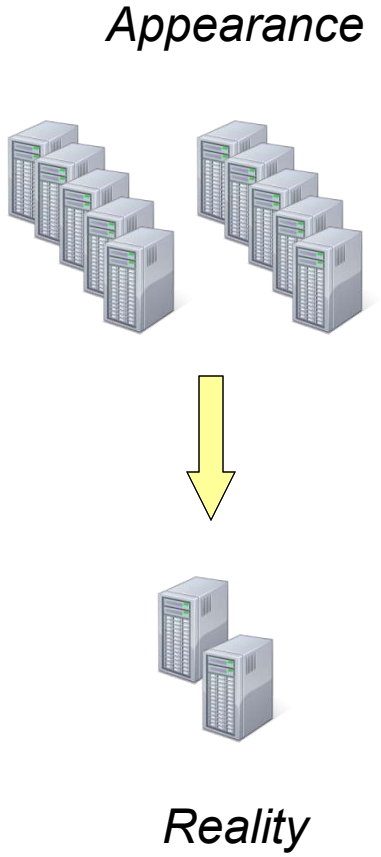
Includes IBM software, systems technology and services

Supports Power and x86 processors in first release

Web 2.0 resource reservation system

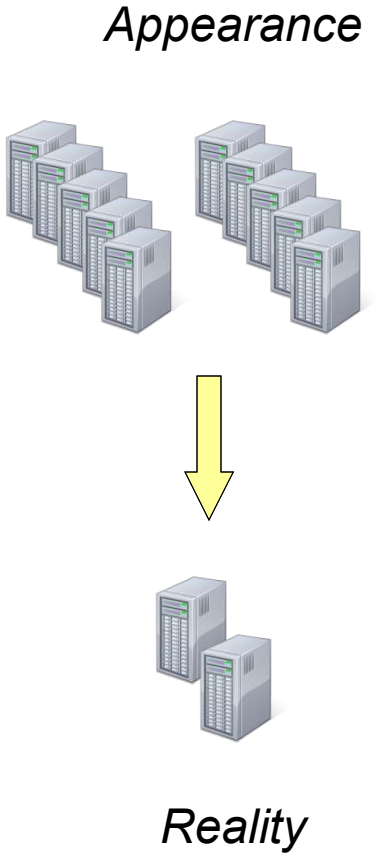
Virtualisation is Magic

- An application running elsewhere can appear to be running on your desktop.
- Your entire desktop could be running elsewhere with only inputs and output displays handled locally.
- What might appear to be dedicated hardware might actually be virtualised software images swapped in and out as needed.
- Your hardware can be kept busier and you can use less of it.
- With IBM System p and System z, new hardware can be installed while the software keeps running, allowing more virtual machines dynamically.
- You can save money.



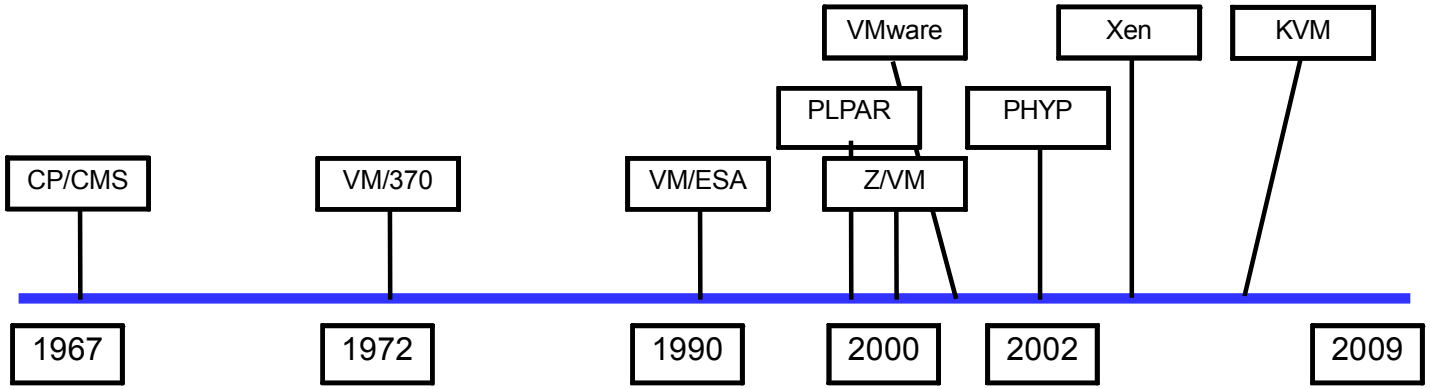
Virtualisation: Common Elements of Success

- **Increases Hardware Utilization**
  - Leverage hardware investment
  - This is how it all started in the '60s
- **Saves Energy**
  - Consolidate workloads onto smaller set of hardware resources
  - Reduce “server sprawl”
- **Reduces Administrative Costs**
  - Better planning of downtime, avoidance of downtime, greater automation and mobility of workloads

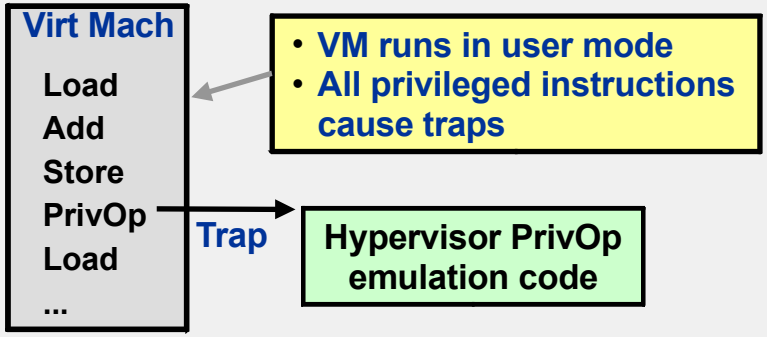


History of Virtualisation at IBM

- **42 years of experience virtualising our servers**
  - Virtualisation was originally developed to make better use of critical hardware
  - IBM runs Linux as a first-class virtualized OS across our entire hardware portfolio
  - IBM is still innovating in our Linux Technology Center as well as in IBM Research
  - Our Linux Integration Center can help you pilot Linux, virtualisation, and cloud projects

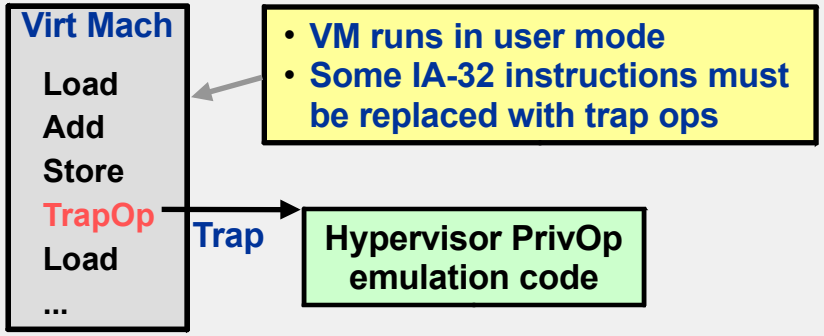


Trap and Emulate



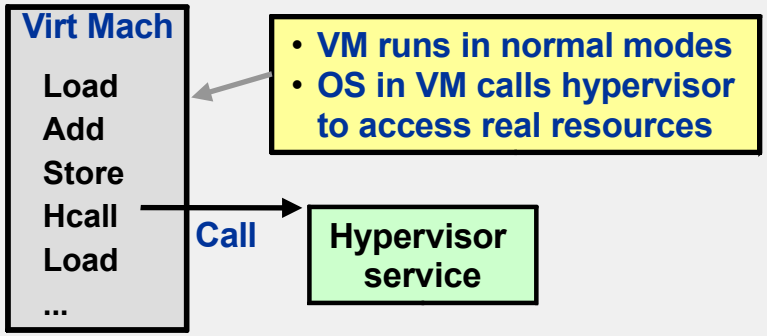
Examples: CP-67, VM/370
Benefits: Runs unmodified OS
Issues: Substantial overhead

Translate, Trap, and Emulate



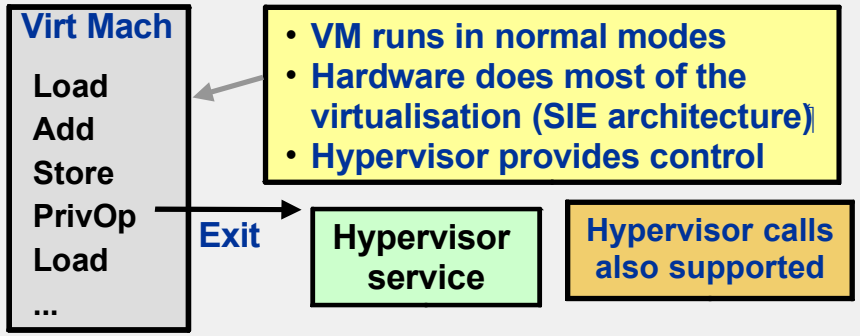
Examples: VMware, Microsoft VS
Benefits: Runs unmodified, translated OS
Issues: Substantial overhead

Hypervisor Calls ("Paravirtualisation")



Examples: POWER Hypervisor, Xen
Benefits: High efficiency
Issues: OS must be modified to issue Hcalls

Direct Hardware Virtualisation



Examples: System z LPAR, z/VM, KVM, Hyper-V
Benefits: High efficiency, runs unmodified OS
Issues: Requires underlying hardware support

What's Special about Linux?

- **Linux supports multiple hardware platforms**
  - Spanning from embedded devices to supercomputers
  - Speed of support for new platforms
  - Availability of skills, portability of applications
  - Scale-out through clustering as well as scale-up through SMP

- **Linux has an affinity with virtualisation**
  - Supported on all major hypervisors, from z/VM to VMware and Hyper-V
  - Ability to be paravirtualised with Xen
  - Inclusion of KVM as part of Linux

- **Linux is flexible**
  - Modular and customizable, with flexible usage licensing
- **Linux is developed by an open community**
  - Sharing skills and resources, leading to faster development

Virtual Linux Desktops

- **Linux saves costs on the desktop**
  - This is the primary reason for adoption
  - With free and open source productivity suites, this is a very viable option
- **Virtual Linux desktop solutions can help reduce desk-side and help desk support costs**
  - Instant client updates, rapid problem resolution, simplified application deployment and backup
  - Significantly reduced threat of data loss through component failure or theft
- **For many, such a solution is a very tangible example of the power of Linux, virtualisation, and cloud computing acting in concert.**

The Future of Cloud Computing

- Real interoperability through open standards
- Increasing number of workloads transitioning to the private and public clouds
- New workloads and business opportunities arising from and running on clouds
- Adoption of the hybrid cloud model
- Cloud computing as the foundation for Smarter Planet
- Greater use of Linux on desktops and in datacenters

Parting ideas

- Cloud computing has been around for while, but naming a concept gives it power and acceptance.
- Cloud computing will be significant on both the server and the desktop.
- Virtualisation is a necessary technology to drive efficiencies in cloud (and other) computing.
- Linux will be especially important for cloud computing because of its security, scalability, flexibility, reliability, and portability.
- Traditional enterprise and desktop computing will not vanish overnight, but cloud computing will continue to grow in importance.
- “Open” is good.

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