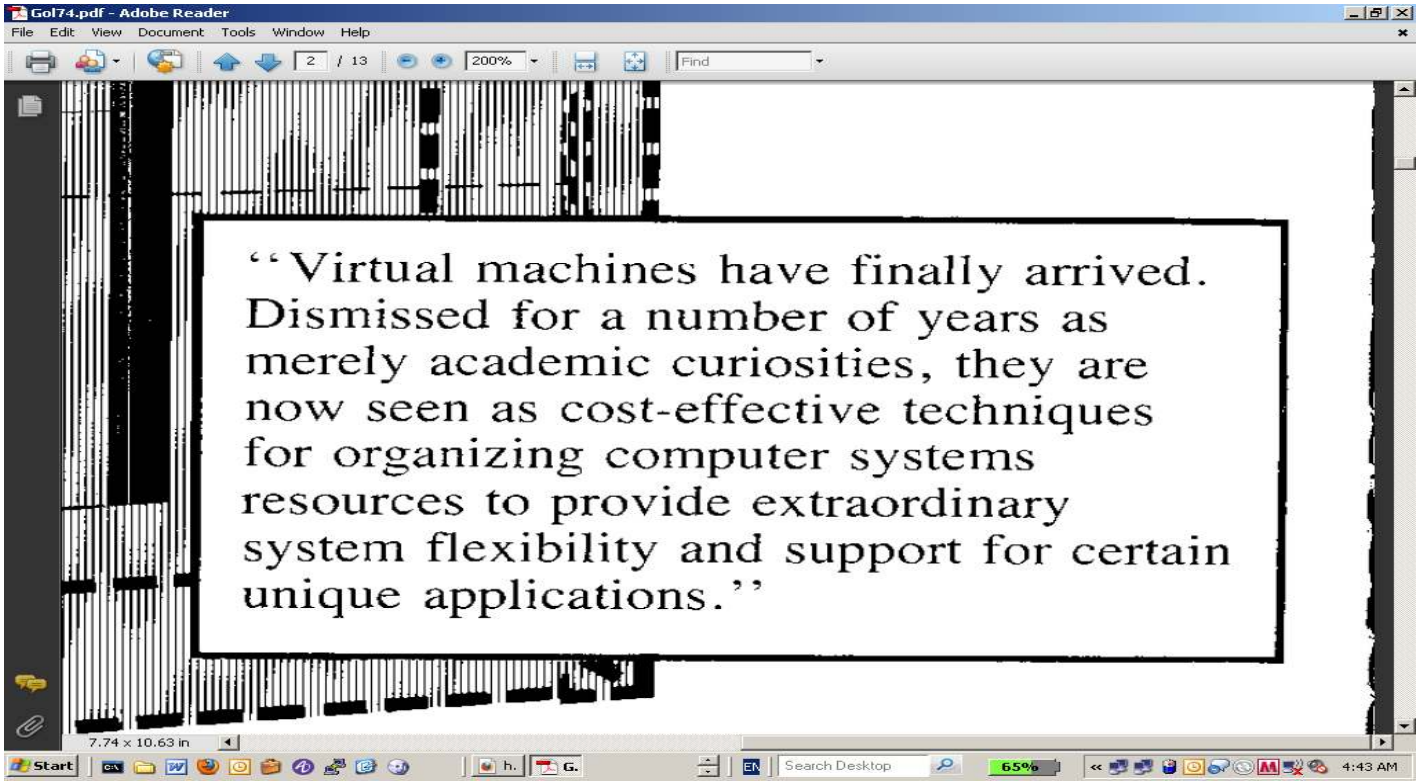
Data Center Management Problems

Dimitri Stiliadis

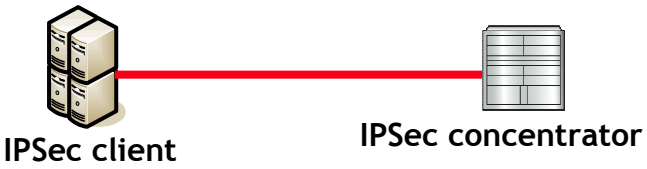
Management and Virtual Machines

Introduction

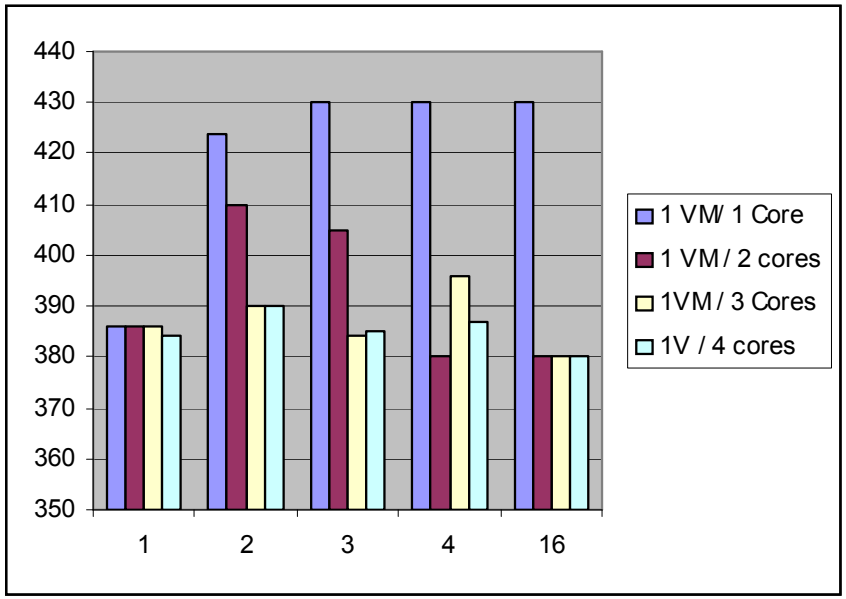


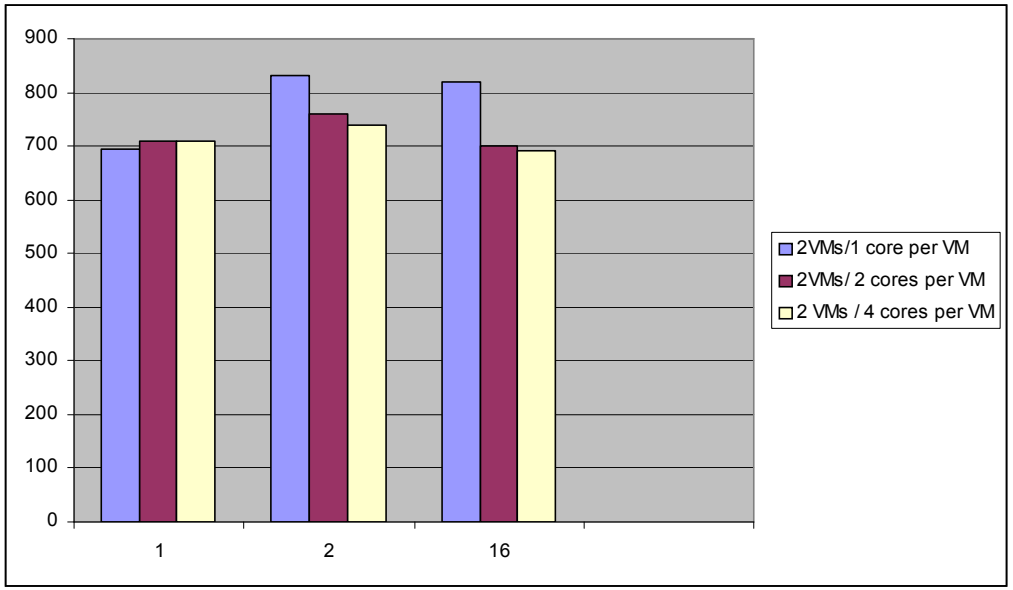
Source: Survey of Virtual Machine Research, R.P. Goldberg, Computer, June 1974

An Example Application



Measure end-to-end throughput if concentrator is implemented as a VM





Increasing cores/VM deteriorates performance

Configuration Complexities

- Over 1000 parameters per hypervisor
  - Customize schedulers, memory, CPU, core-allocation, queues, buffers, etc
- Design on a physical machine does not directly map to virtual environment
  - IO drivers depend on physical and not virtual hardware
  - Multi-core and IO require special attention in order to spread load
- Join optimization of host and guest machines is a big challenge
  - Interaction between different types of VM co-hosted by a physical host

"Further, we observe that while accommodating enterprise IP telephony, especially media applications, in a virtualized setup can be challenging, with appropriate tuning, it is possible to get reasonable performance for medium scale deployments."

Source: "Performance implications of Hosting Enterprise Telephony Applications on Virtualized Multi-core platforms", IPT 2009

The Easy Way Out

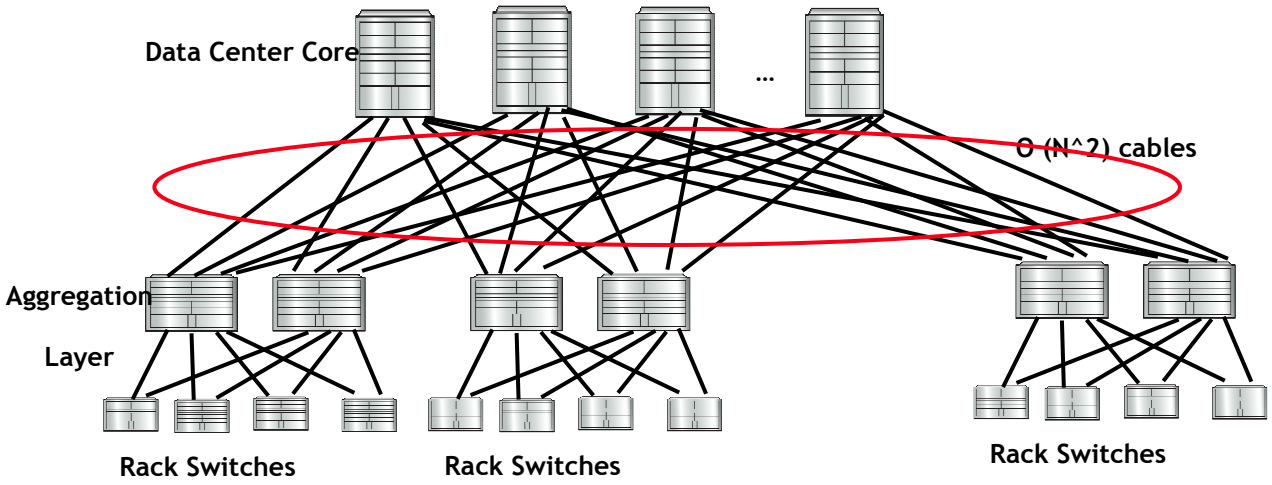
- Over-provisioning allows us to ignore the problem
- But ….

Management and the Network

What about the network ?

- *Facebook representative in Ethernet Alliance*
  - *“It's reasonable to think Facebook will need its data center backbone fabric to grow to 64 Tbit/s total capacity by the end of next year.”*
  - *“His ideal Ethernet box would have 16-Tbit/s switching capacity and 80 100-Gbit/s Ethernet ports or 800 10-Gbit/s Ethernet ports.”*

Data Center Network Architecture



"Lee drew up a diagram of what Facebook's future data center fabric -- that is, the interconnection of its switch/routers -- would look like if he had to use today's equipment and 10-Gbit/s Ethernet. Instead of the familiar criss-crossing mesh diagram, he got a solid wall of black, signifying just how many connections he'd need."

Source *http://www.lightreading.com/document.asp?doc_id=181899*

Do Optics and WDM Have a Role in the Data Center ?