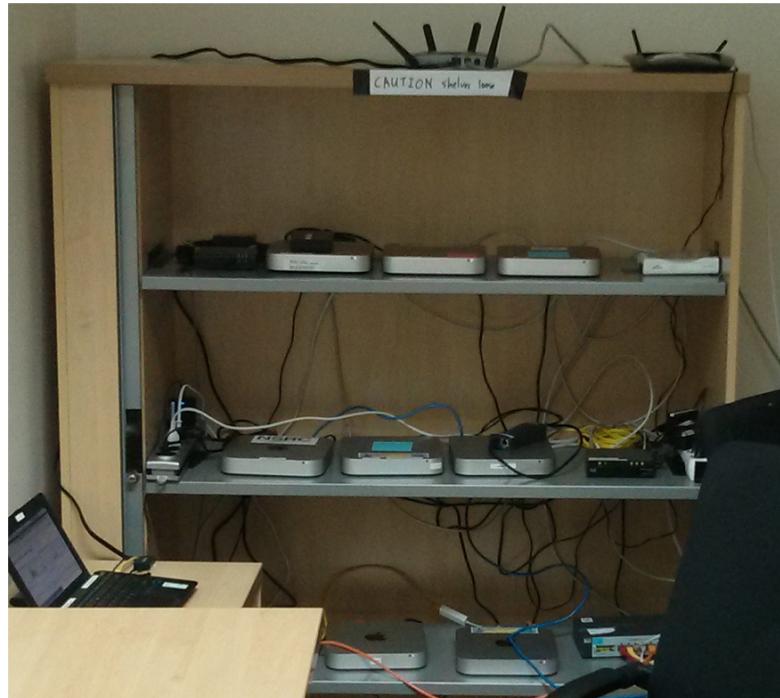


Virtualization Overview



Isabel Odida

AFNOG SS-E 2018

What are we using this Year?

- NUC servers
- Intel core i5 quad core 8 hyperthreads
- 32GB of ram
- 2 x 256GB SATA SSD
- A pretty hefty server
- Less than \$2k
- Drawbacks
 - One psu
 - OOB is kind of a pain
- Ubuntu 14.04 / KVM

What is it?

- Virtualization is the abstraction of the manifestation of a resource from the actual physical instance of that resource.
- What Computing/Network resources can be virtualized?
 - Virtually anything! :)

Anything?

- In the context of this course. We're interested in virtualization along two dimensions:
 - Services
 - Hosts

Resource/Service virtualization

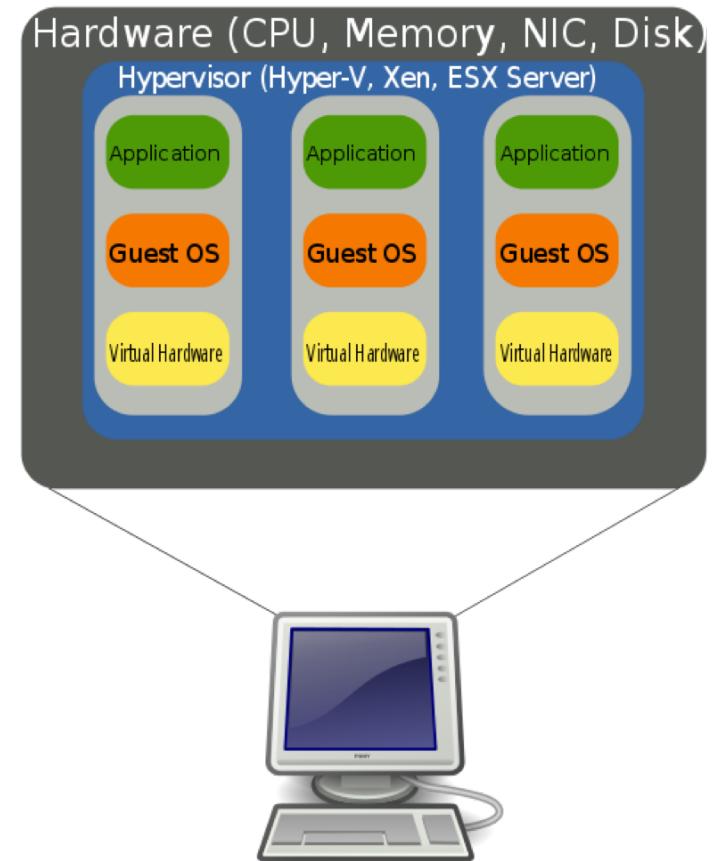
- Examples:
 - Load-balancers
 - DNS Based GLB
 - HTTP(S) Virtual Hosting
 - MX records
 - Virtual Switches
 - Virtual Routers
 - Virtual Firewalls

Resource Virtualization - Continued

- HTTP virtual hosts
 - Multiple websites on one system
- Load Balancing
 - One (or many sites or applications) across many systems
 - Can be done at Layer-3/4/7

Host Virtualization

- Examples
 - VMware
 - KVM (Used in class)
 - Virtual-Box (Simplest to use)
 - XEN
 - FreeBSD and Linux Jails
 - Windows Hyper-V
 - LXC/D (I shall never recommend)
 - Proxmox



What problem are we attempting to solve with host virtualization.

- Problem 1 – Idle capacity.
 - Most of the machines in your datacenter are idle most of the time.
 - Capacity you're not using:
 - Cost money up front
 - Cost money to operate
 - Reduces your return on capital
 - Packing discrete systems into a smaller number of servers provides savings along virtually every dimension.

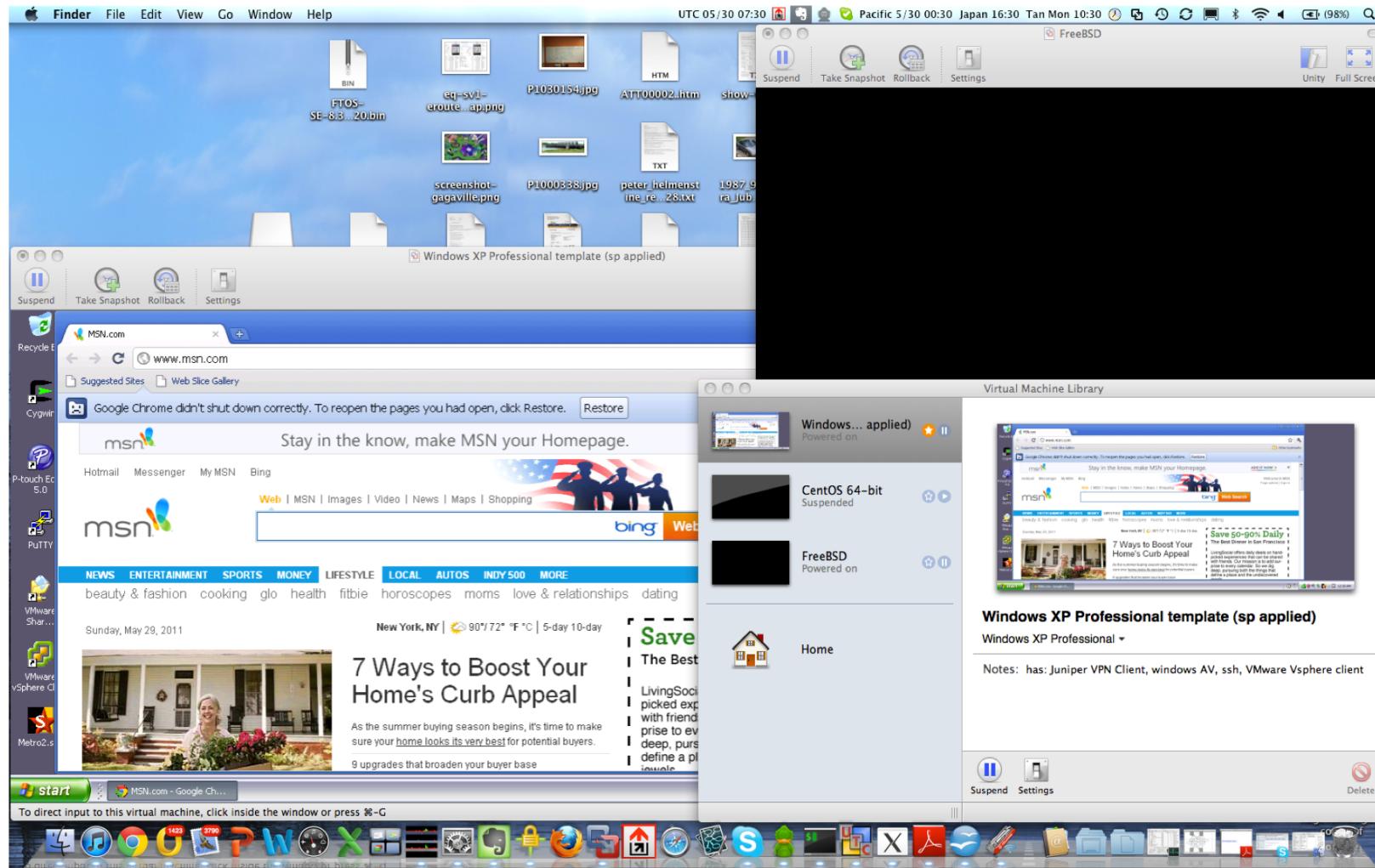
Problems - Continued

- Problem 2 – Provisioning
 - Spinning up a new service involves:
 - Acquiring the hardware
 - Building the server
 - Integration with existing services
 - With virtualization we're aiming to short-circuit that
 - Capacity is a resource
 - Machine instances may be cloned or provisioned from common basic images
 - Resources are purchased in bulk and assigned to applications as necessary.

Problems - Continued

- Problem 3 – Hardware abstraction
 - Operating systems, servers, and applications evolve at different rates.
 - Providing a common set of infrastructure resources means, virtualized systems are portable across servers
 - Hardware failure can more easily be managed.
- Abstraction may come at a performance cost however.
(some workloads are more expensive than others)
 - See:
<http://blog.xen.org/index.php/2011/11/29/baremetal-vs-xen-vs-kvm-redux/>

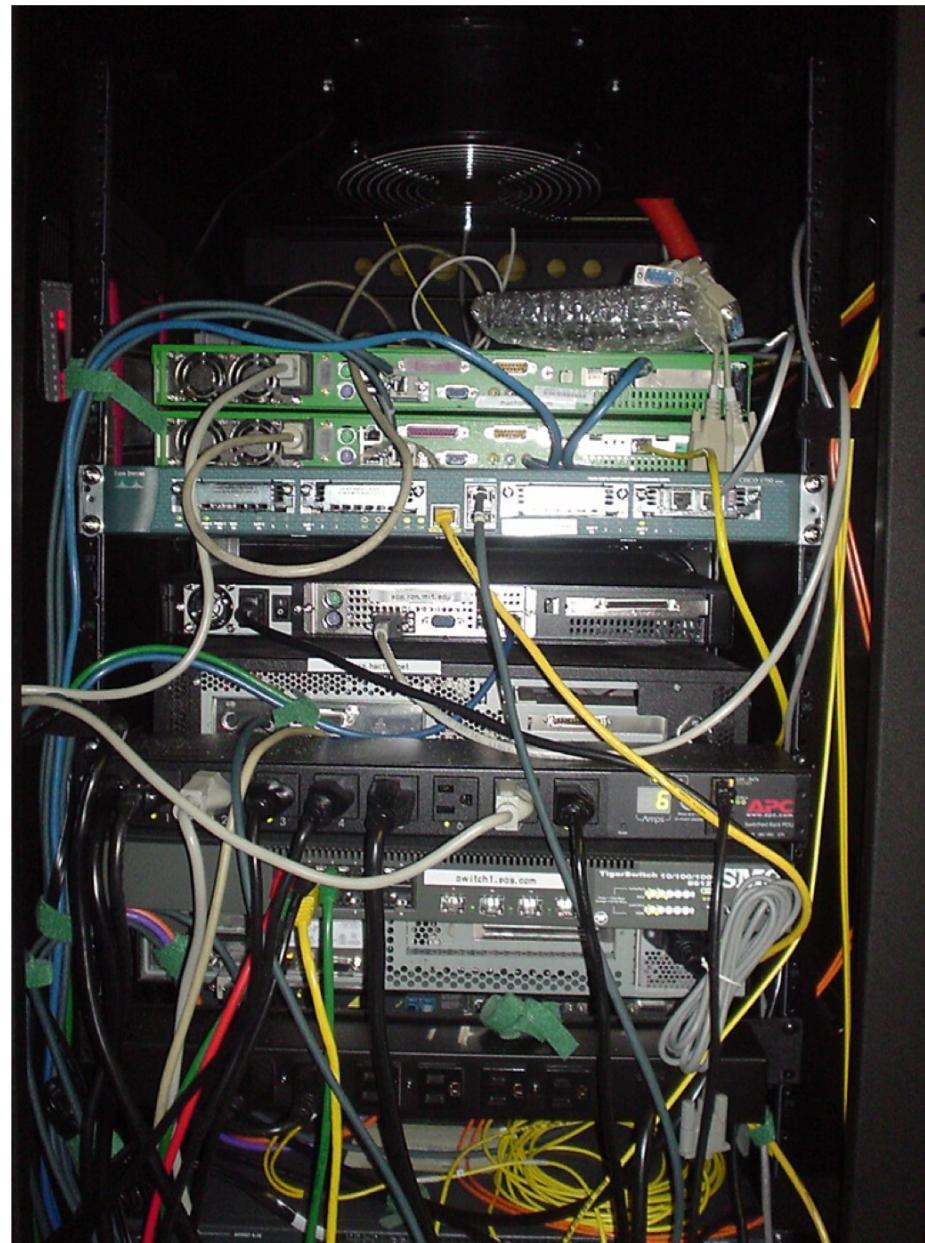
Examples – Desktop Virtualization



Desktop Virtualization

- Uses
 - Prototyping services or applications before deployment
 - Utilities that don't run on your operating system
 - Maintaining multiple versions of an environment for support purposes.
 - Staying familiar with unix while running windows (consider compared to the alternative (dual-booting))
- Issues
 - Emulating multiple computers on your laptop/desktop is somewhat resource intensive
- Vmware player and VirtualBox are free.
 - <http://www.virtualbox.org/wiki/Downloads>
 - <https://my.vmware.com/web/vmware/downloads>

Examples – Server Virtualization



Virtualized Servers as a Service (Amazon Web Services)

- Much as collocated servers, are available from a hosting provider, virtual servers are also available.
- Model is:
 - You pay for what you use.
 - Flexibility, need fewer servers today than you used, yesterday.
 - Leverage other amazon tools (storage/map-reduce/load-balancing/payments etc)

AWS Steps

- Select availability zone
- Launch new instance
- Select appropriate ami
- Associate with ssh key
- Launch instance
- Add ip
- SSH into new machine instance.
- t1-micro-instances run \$54 a year + bandwidth

Try it for free...

- Free tier for the first Calender year is (per month):
 - 750 hours of EC2 running Linux/Unix Micro instance usage
 - 750 hours of Elastic Load Balancing plus 15 GB data processing
 - 10 GB of Amazon Elastic Block Storage (EBS) plus 1 million IOs, 1 GB snapshot storage, 10,000 snapshot Get Requests and 1,000 snapshot Put Requests
 - 15 GB of bandwidth in and 15 GB of bandwidth out aggregated across all AWS services
- Which is not to say that, at scale EC2 is particularly cheap, (It isn't)
 - Limited capital at risk is in the context of prototyping or experimentation however.

AWS - Continued

- For provisioning purposes cli interaction is possible:
 - <http://aws.amazon.com/developertools/351>
- Along with tools to support the provisioning and destruction of virtual machines.

Provisioning and management

- Is the glue that makes virtualization usable
- In commercial virtualization environments the provisioning/management toolkits represent the bulk of the licensing cost (VMware) and the secret sauce (VMotion, disaster recovery, backup, etc)
- Examples:
 - XEN tools – a collection of perl scripts for spinning VMs <http://www.xen-tools.org/software/xen-tools/>
 - KVM tools - http://www.linux-kvm.org/page/Management_Tools
 - Cloud.com/cloud-stack (orchestration) - <http://www.cloudstack.org/>
 - Rightscale – (orchestration multiple public/private clouds)
<http://www.rightscale.com>
 - Puppet (host / configuration management) -
<http://puppetlabs.com/puppet/>
 - PDSh – (Parallel Shell execution) <http://code.google.com/p/pdsh/>

Can you spot the...

- Web-node?
- Database-node?
- Load-balancer?
- Nameserver?
- DHCP Server?
- Email cluster?
- Devnodes?



Complimentary technologies

- NIC teaming or Link aggregation
- Network attached storage and network centric filesystems
 - NFS
 - Hadoopfs
 - GFS2
- Distributed databases
 - Example mysql cluster
 - Couchbase/Membase
 - OracleRAC

KVM Installation

<http://ws.afnog.org/afnog2018/sie/setup/virtualising/virtualising-sie-howto.md.html>