



MikroTik in a Virtualised Hardware Environment

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Event: MUM Krakow Feb 2008



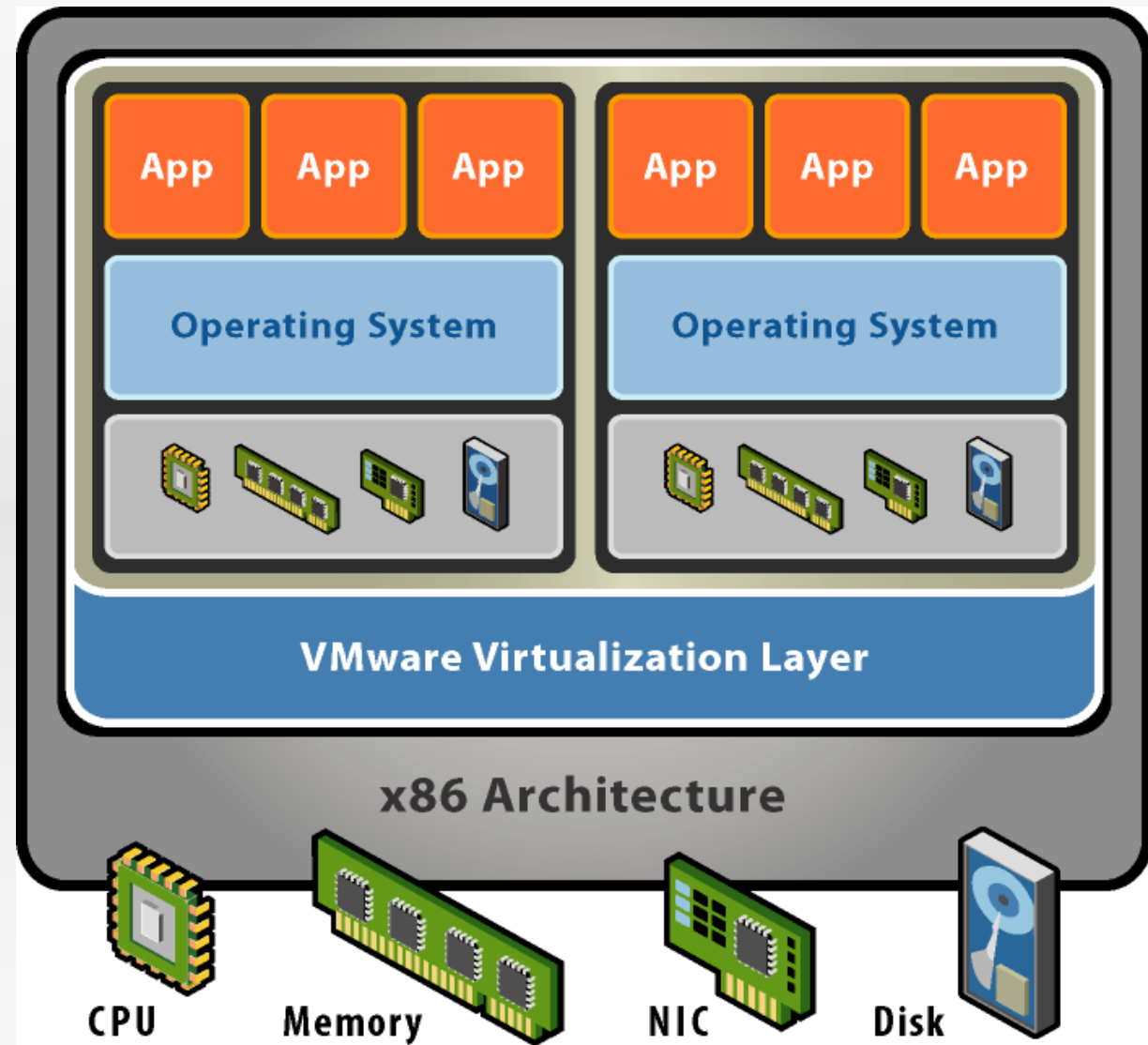


- Understand What is Virtualisation
- Receive a high-level overview of VMware Server
- Understand how to configure a virtual machine for use with Router OS 2.9 & Router OS 3
- Understand how to configure a virtual machine
- Identify where Virtualisation can help
- Identify where Virtualisation can not help



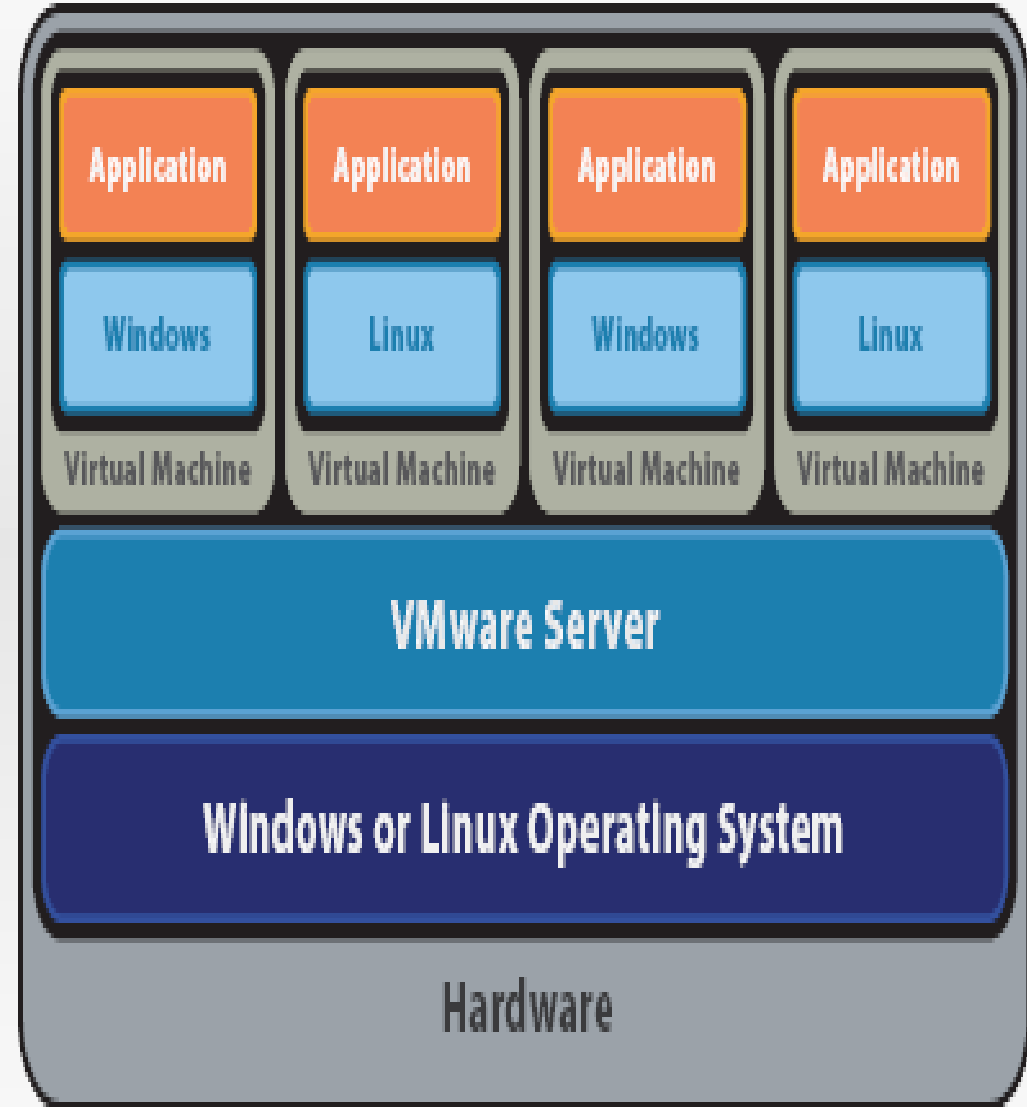
Virtualisation in a nut shell

- Computers running inside computers
- Software system abstracts hardware
- Virtual machine data stored in files
- Virtual machines are isolated and secured from each other.
- Vmware on Windows
- Vmware on Linux
- Vmware on Chassis (ESX)





Virtualisation?





- Abstraction of physical hardware
 - The same virtual hardware is presented to the guest operating system despite the underlying hardware of the server
 - (X86 & x86-64 CPU + Extensions available on host)
- Logical division of physical hardware
 - single powerful host server can be divided into many discrete separate virtual servers.
 - Each of these servers can run different operating systems.
 - Each System can be interconnected via Multiple Virtual Networks



- Vmware server installs and runs as a service on top of a host Windows or Linux operating system.
- A thin virtualisation layer partitions the physical server so that multiple virtual machines can be run simultaneously on a single server.
- Vmware Server isolates each virtual machine from its host and other virtual machines.
- Data does not leak across virtual machines and applications can only communicate over configured network connections

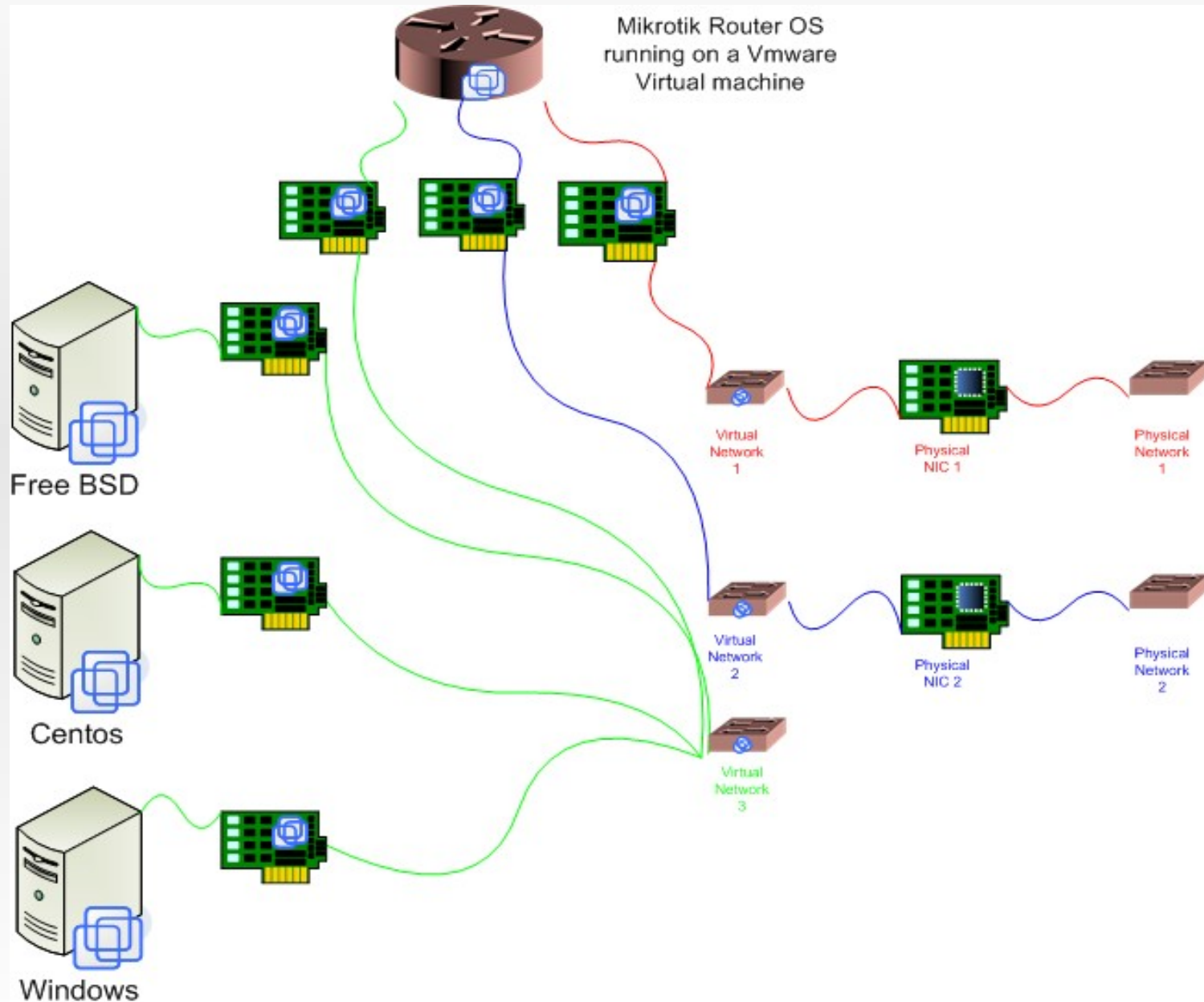


- A virtual machine is like a server, but instead of an electronic mother board it uses a software mother board & BIOS.
- Execution is native
- All configuration and data are stored as files.
- All VMs are hardware independent and run on Vmware server on any x86 physical server.
- Can access physical host hardware resources through emulated hardware with native execution
- Completely isolated and secure.



Virtual Firewall for Virtual Host

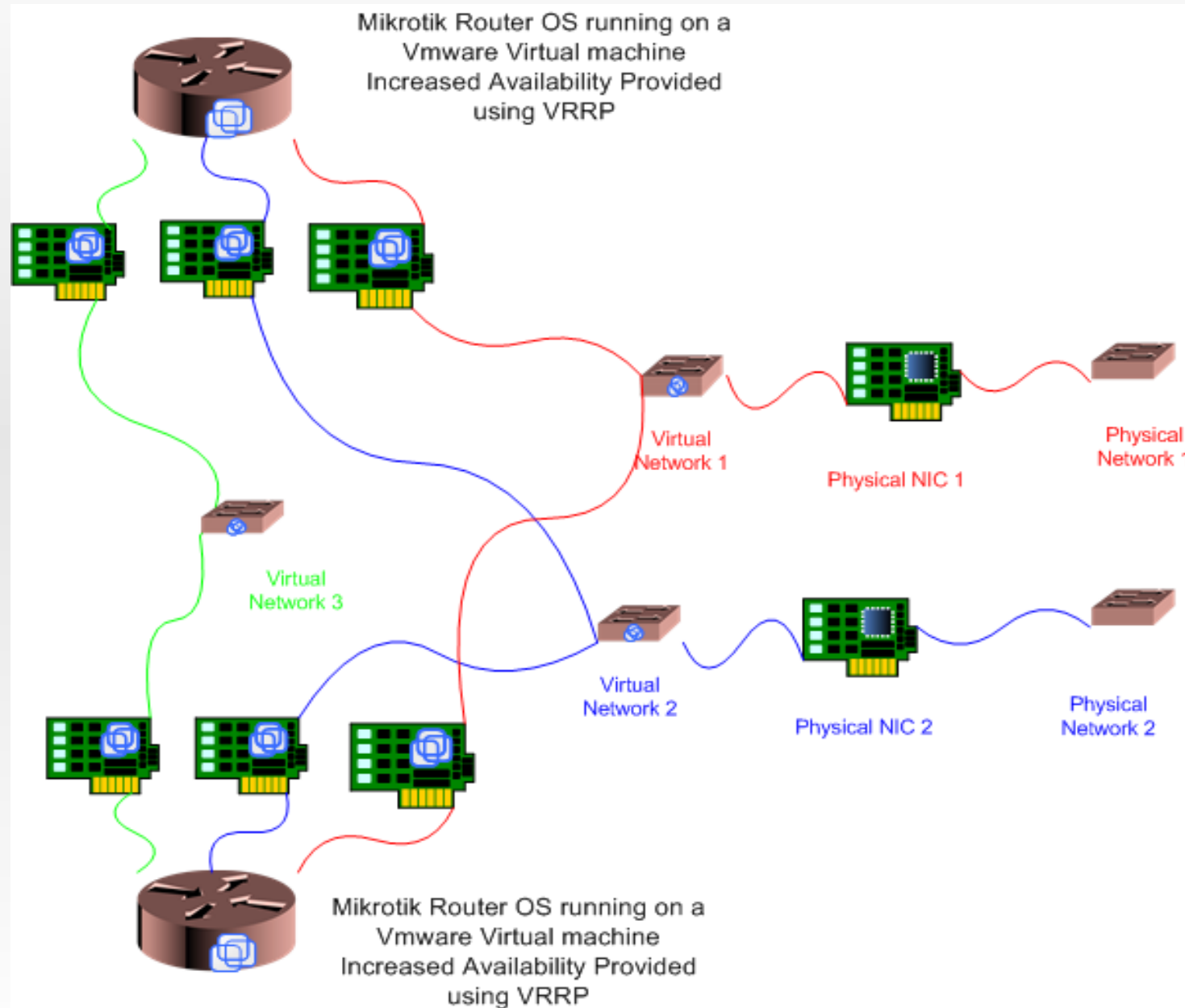
- MikroTik Virtual Router can act as a firewall to protect other virtual machines running on the host
- Each Virtual Network acts as a Switch
- Virtual Networks can be bridged to Physical Network via host physical Ethernet adapters





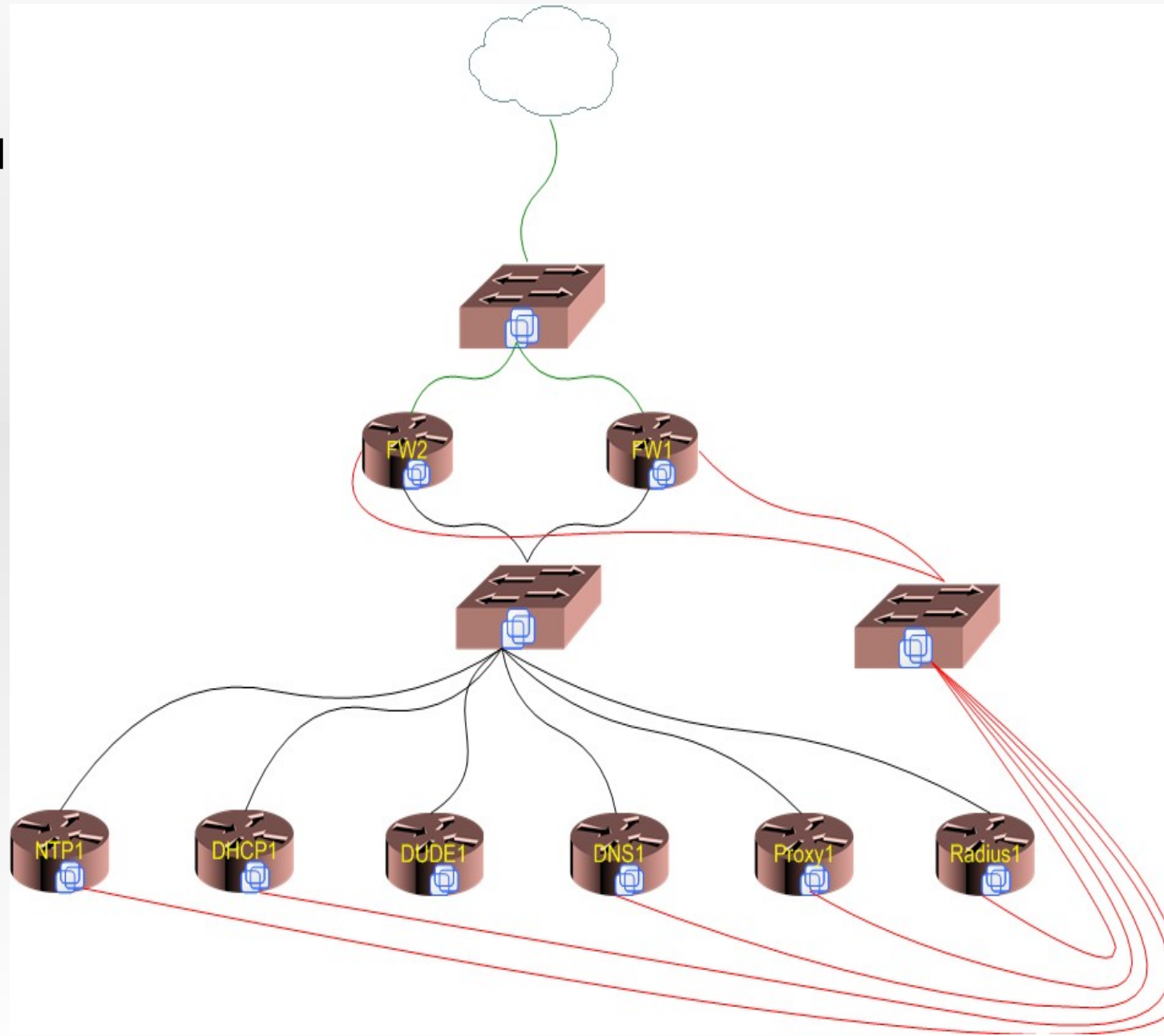
High Availability

- 2 x MikroTik VRRP Enabled Virtual Routers can increase availability
- Quick Fail Over :)
- Router Upgrades
- Router Configuration Maintenance
- Virtual Networks can be bridged to Physical Network via host physical Ethernet adapters





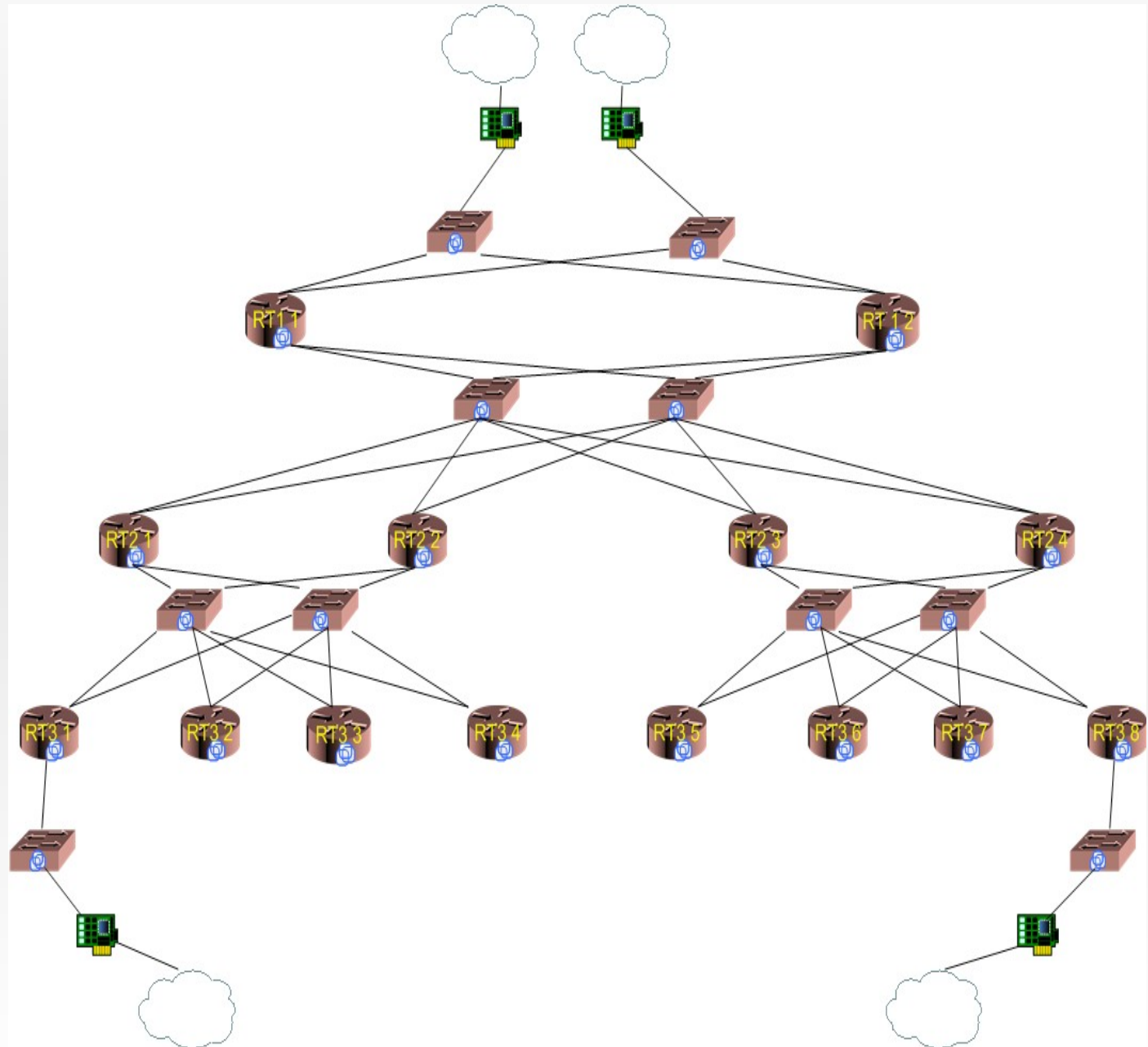
- With Single Purpose MikroTik Appliances
- Services are modularised
- Simplified support
- Minimal possibility of conflicts in services
- Maximises ability to secure hosts
- 1 purpose per host
- Simplifies migration and upgrade of software versions (shut-down services individually when each service is least required)





Virtual Test Network

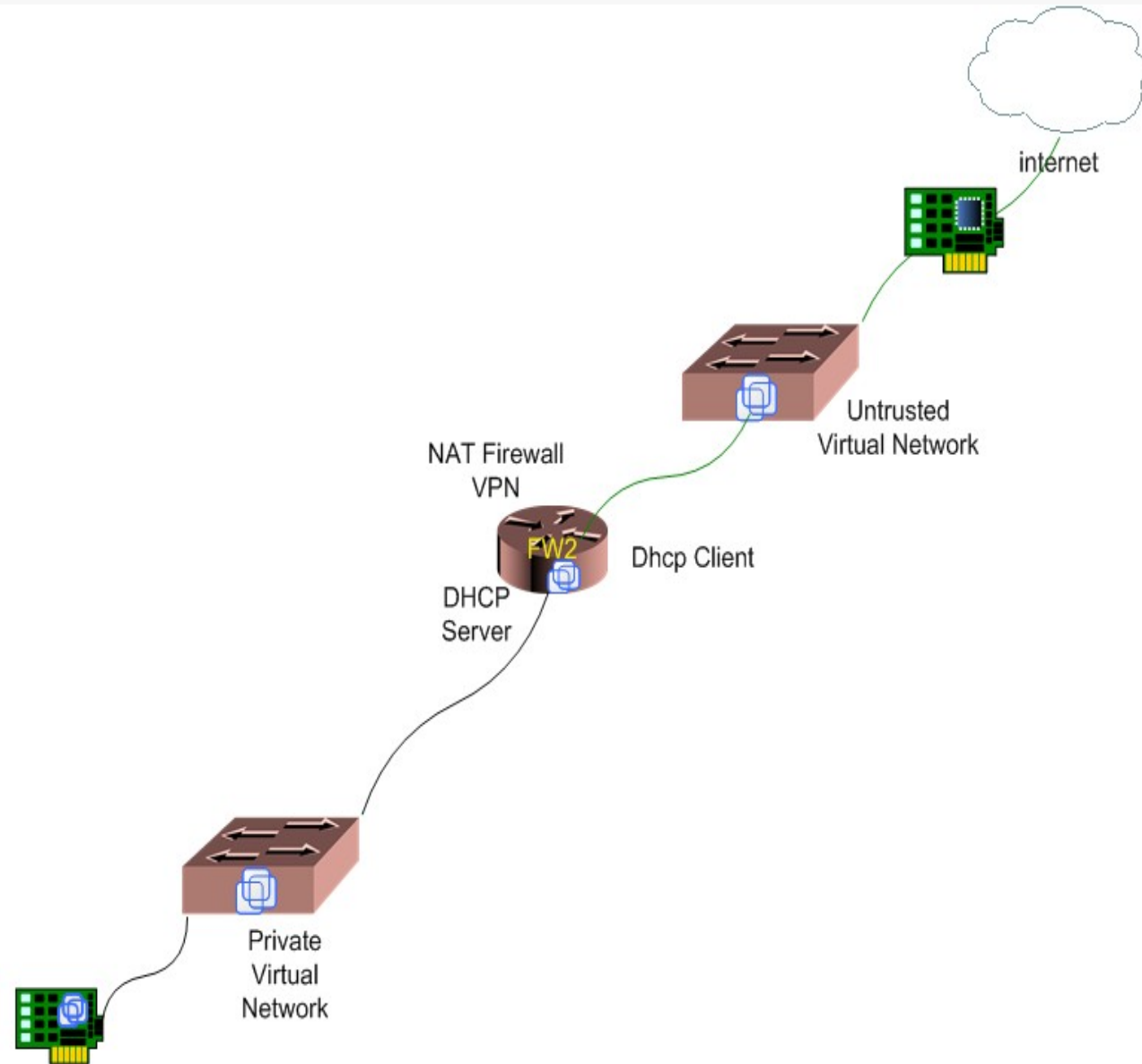
- Virtual Test Labs
- Try out new ideas
- Windows based vmware 10 virtual networks
- Linux based vmware 100 virtual Networks!!!
- You can run many machines concurrently





Laptop /PC with a MikroTik Virtual Router Firewall

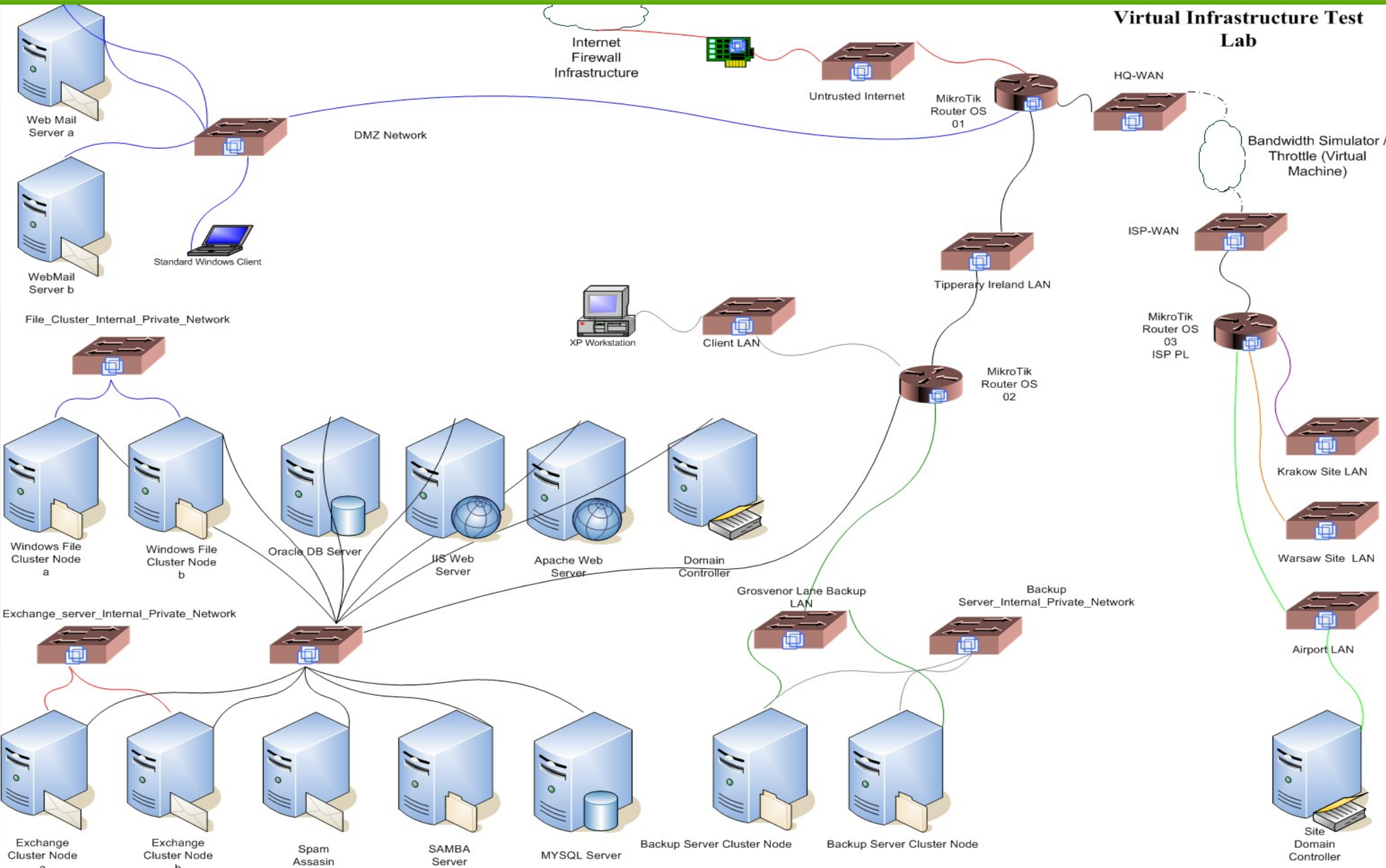
- Disable TCPIP on physical interface
- Bridge (Layer 2) to untrusted virtual network
- Create a Mikrotik Virtual Router with 2 virtual NIC
- Create Private Trusted Virtual Network
- Create Virtual NIC on Host (with TCPIP Enabled)
- Place firewall +NAT Configuration on Mikrotik Router
- Test with NMAP!!!!!!



Virtual NIC on the laptop with DHCP Client enabled



Virtual Infrastructure





- Run MikroTik on previously incompatible hardware
 - High End Servers
 - Raid Controllers,
 - SCSI/ SAS / μ SATA Disks/ SAN Attached Storage
 - Custom Network hardware
 - Encrypted Harddisks
- Flexibility for proactive Disaster recovery in the event of hardware failure
- Increased hardware usage through more comprehensive driver support (DMA) in the underlying operating system
- Break up individual router tasks into separate virtual Machines. (Scalability and Security)
- Remote Reconfiguration Risk Reduction



- Responsive DR functionality, full systems can be easily moved from one physical server to another, even while in operation. (Snap Shots)
- Can be built and distributed as plug-and-play virtual appliances (help sales and expose product to new markets and new customers)
- New Infrastructure services can be introduced remotely without compromising stability of existing services (function isolation)



- Core of Networks
 - Using VRRP for increased availability
 - Linux Clusters for maximum availability
 - Provide an end to end MikroTik Solutions
 - Provide high performance multigigabit throughput**
 -
 - Provide Multi purpose logically separate services
- Laptops (fire walling & Security)
 - VPN
 - Secure Remote Assistance
- Test labs
 - Testing Dynamic Routing Protocol Configuration
 - Testing QOS policies <http://wirelessconnect.eu/> Copyright 2008



Virtualisation Not Always an option :(

- Virtualisation is not practical in all cases
 - ROI ?
 - Do you need to have scalability ?
 - Do you need to add complexity ?
 - RB1000 better applied in Distribution Networks
 - Cluster 2x RB 1000s for high availability



- Virtualisation requires good hardware to function
- Xeon / Opteron Processors
- Hardware Virtualisation Support If possible (Not Essential)
- Multiple PCI/X buses
- Multiple PCIExpress lanes (1x 2.5Gb/s... 8x 20Gb/s)
- Memory Capacity on the host server must be adequate
- Memory bandwidth determines Virtual Network bandwidth



Virtual Machine Core Specifications

- Virtual Processor
 - Intel Pentium II or later, or AMD Athlon or later, depending on host processor;
 - Intel EMT64VT (experimental support)
 - Single and multiprocessor per virtual machine on symmetric multiprocessor (SMP) systems.
 - Virtual Machine Load is not dedicated to one processor or core, virtual machines are executed across all available CPUs which can be very helpful in maintaining high performance under high loads
- Virtual Chipset
 - Intel 440BX based motherboard with NS338 SIO chip and 82093AA IOAPIC
- Virtual BIOS
 - PhoenixBIOS 4.0 Release 6 with VESA BIOS
 - DMI/SMBIOS compliant for system management agent support



- Virtual Memory
 - Up to 3600MB of memory per virtual machine, depending on the host system's configuration and the amount of memory on the physical host
- Virtual IDE Drives
 - Up to four devices: IDE HDDs, CDROM or DVD
 - Hard disks can be virtual disks or physical disks. IDE virtual disks up to 950GB
 - CDROM can be a physical device or an ISO image file



- Virtual Ethernet Card
 - Up to four virtual Ethernet cards
 - AMD Pcnnet PCI II compatible (100Mb/s)**
 - PXE ROM version 2.0 (you can use net install)
- Virtual Networking
 - 10 Virtual Ethernet switches (virtual Networks / Vmnets) windows OS Host
 - 100 Virtual Ethernet switches (virtual Networks / Vmnets) Linux Based Host



Virtual Machine Remote Management

- Vmware Remote Console connects to server on TCP port 902 (Linux and Windows) (secure)
 - Most Powerful VM Management tool
 - Allows you local console access to routers.
- Vmware Server MUI secure website listens on TCP port 8333 (requires optional pack for Linux and IIS on Windows)
- RDP (local Console access) (windows)
- SSH (linux)
- You can configure Out of Band Management.



- Setup of Physical and virtual NICs
 - If Firewall remove IP address / Disable TCP/IP from all physical interfaces on the host OS (Layer 2)
 - Minimise Virtual Adapters on the host
 - Setup additional Vmware Vmnets (virtual networks)
 - Minimise vmnets for performance (Production boxes)
 - Maximise vmnets for testing flexibility (test/training boxes)
- Disable Vmware Server Nat Service
- Disable Vmware DHCP Config Service
- Use MikroTik Virtual Routers for virtual Internetworking



- Note that MT ROS 2.9.XX is based on the 2.4 Linux kernel series.
- Note that MT ROS2.9.XX supports 1 CPU
- Note that MT ROS2.9.XX requires a min 32MB (X86) of RAM up to a max 1GB of RAM
- Note that MT ROS2.9.XX requires IDE Storage
- All virtual disks should be preallocated fixed size files (better performance/ no Disk Fragmentation)



- Note that MT ROS 3 is based on the 2.6 Linux kernel series.
- Note that MT ROS 3 supports 1 CPU – Multi Core/ Multi CPU (SMP Support)
- Note that MT ROS3.XX requires a min 32MB (X86) of RAM up to a max 2GB of RAM
- Note that MT ROS 3 supports IDE & SATA Storage
- All virtual disks should be preallocated fixed size files (better performance/ no Disk Fragmentation)



- <http://mikrotik.com/>
- <http://wirelessconnect.eu/store/>
- <http://vmware.com/>
- <http://centos.org/>
- <http://redhat.com/>
- <http://microsoft.com/virtualserver/>