WV28

Best Practices for Creating Virtual Appliances

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Agenda

- What are Virtual Appliances?
- Virtual Appliance Benefits
- What's wrong with 'traditional' Operating Systems?
- Best practices for designing Virtual Appliances
- Available toolkits, services, frameworks for building Virtual Appliances
- Demo
- Q&A

What are Virtual Appliances?

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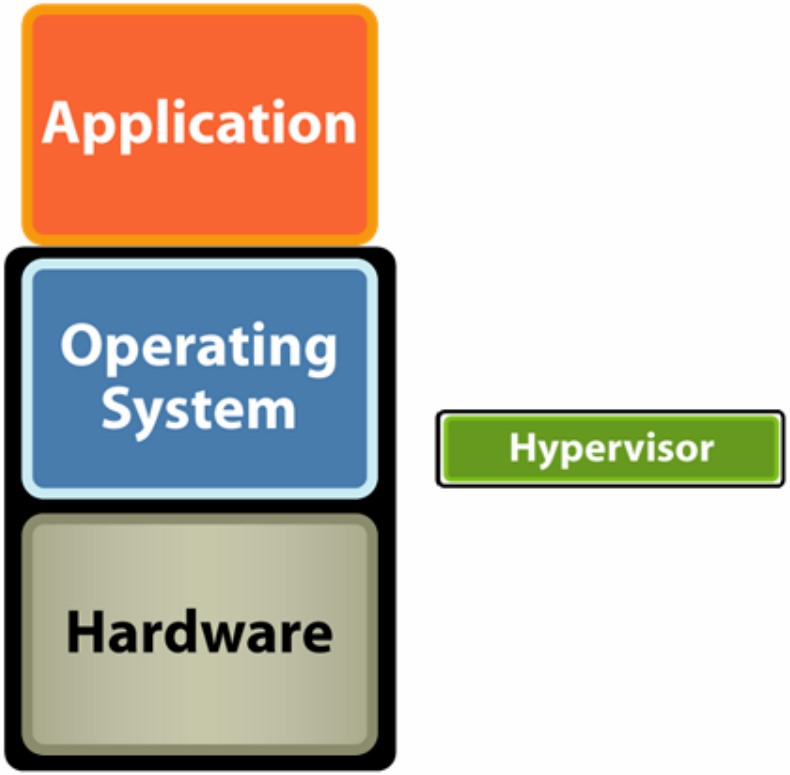

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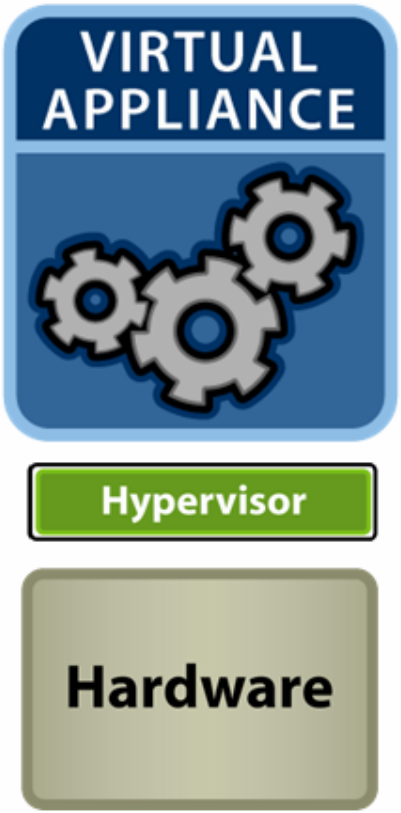

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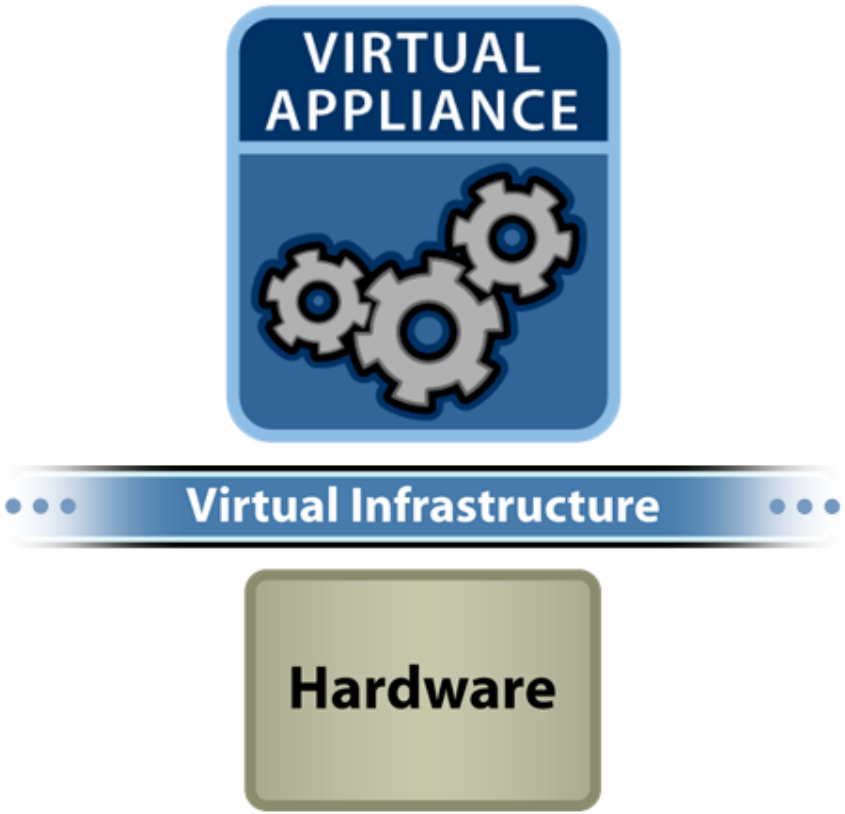


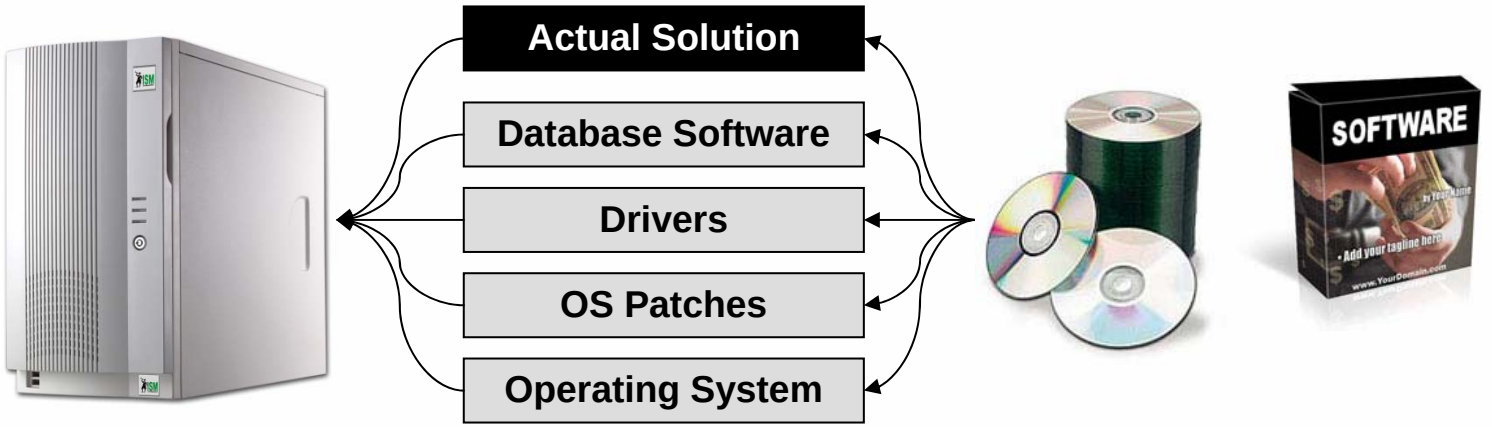
- A virtual appliance is a preinstalled and preconfigured application packaged along with an OS in a virtual machine
- Virtual appliances represent an evolutionary step in the distribution of software solutions
- Virtual appliances take the positive attributes of both the traditional software distribution model and the hardware appliance distribution model and combines them without most of the drawbacks of these older models

Traditional Software-Based Solutions: PROS

- Works with standard corporate x86 hardware
- Works with 1 or more common operating systems
- Contains just the bits required to solve a specific problem
- Can be delivered in a downloadable form

Traditional Software-Based Solutions: CONS

- Assembly required!
- User has to acquire all of the required components of one of the “supported” stacks
- User has to install, configure and maintain everything
- Manually intensive process
- Error prone
- Difficult for solution provider to replicate and support
- Fault tolerance (HA/DR) not always there, implemented in inconsistent fashion (requiring run books for each process), and/or an expensive add-on



Hardware Appliance-Based Solutions: PROS

- Comes “pre-assembled” with all of the required components for the solution (hardware, OS, application bits)
- Simple plug-and-play installation
- Consistent stack makes support easier for vendor
- Underlying operating system can be “hidden” from user

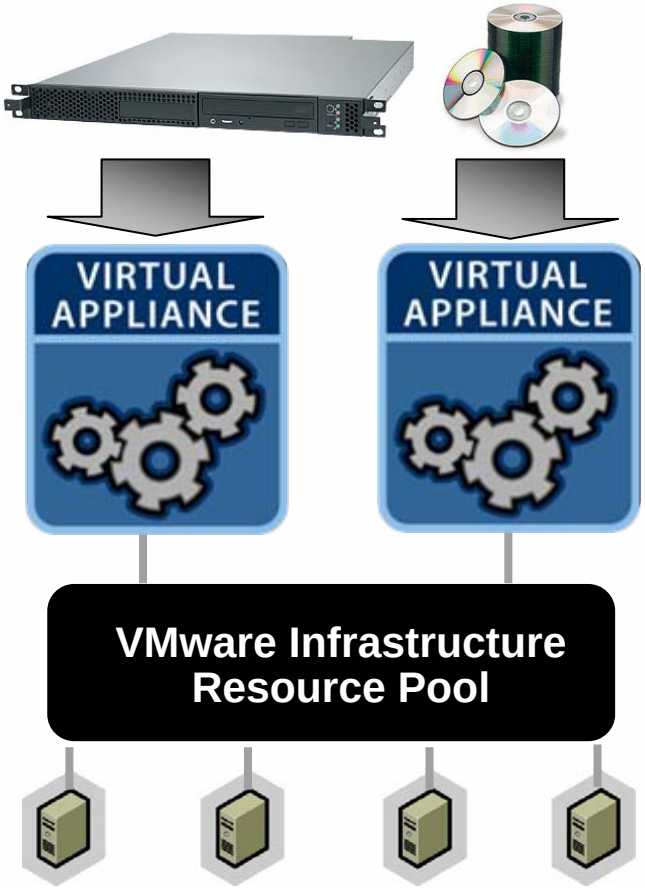
Hardware Appliance-Based Solutions: CONS

- Proliferation of non-standard hardware
- Hardware support provided by non-standard vendor (possibly multiple vendors: one for hardware, one for overall solution)
- Operations team has to learn how to support both the hardware and the solution
- Hardware used for a single purpose may be under utilized
- Hardware takes up rack-space, consumes additional power, and requires additional HVAC

Virtual Appliance Benefits

Virtual Appliance Benefits

Virtual Appliances deployed on VMware Infrastructure simplify application management



- **By deploying virtual appliances on VMware Infrastructure, customers immediately gain:**
  - VMware HA
  - VMware DRS
  - VMware Consolidated Backup
  - VMotion
  - Ingenious Integration Opportunities

Virtual Appliance Benefits

Solution Providers

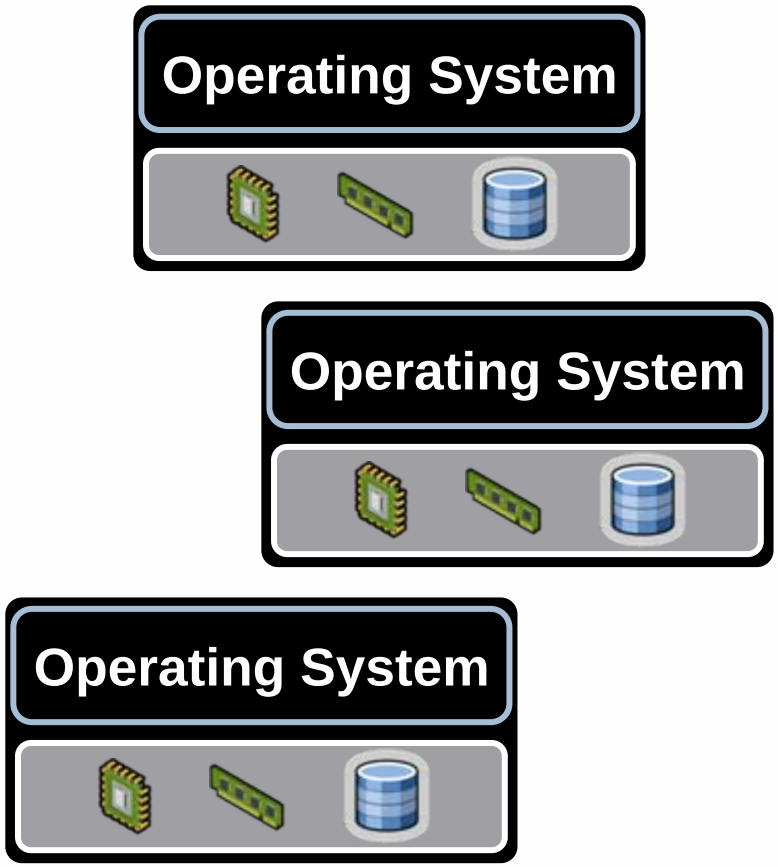
- Reduce code complexity
- Increase quality
- Simplify logistics
- Reduce sales cycles
- Reduce support costs
- Enhance performance
- Provide scalability and reliability

Solution Users

- Simple, quick evaluations
- Eases enterprise integration
- Support for each component provided by the *right* party
- Reduce patching headaches
- Simplify operations
- Common, high-value services for all apps

What's Wrong with "Traditional" Operating Systems?

Traditional View of the Operating System



OS jobs

1. Drive and manage hardware

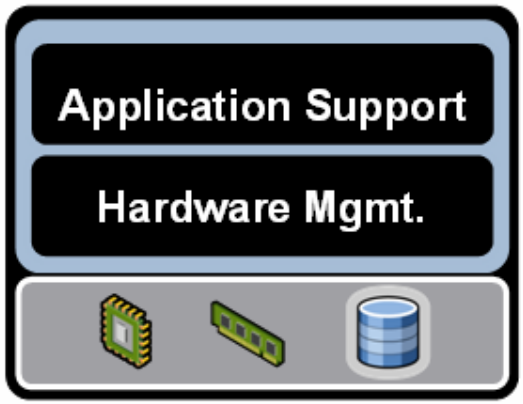
2. Export better abstraction

OS is viewed as an extension of hardware

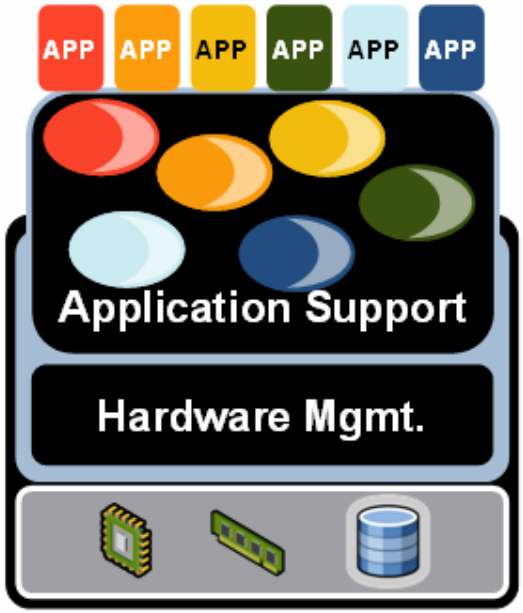
Privileged position – Only one OS

Modern OS ‘Evolution’

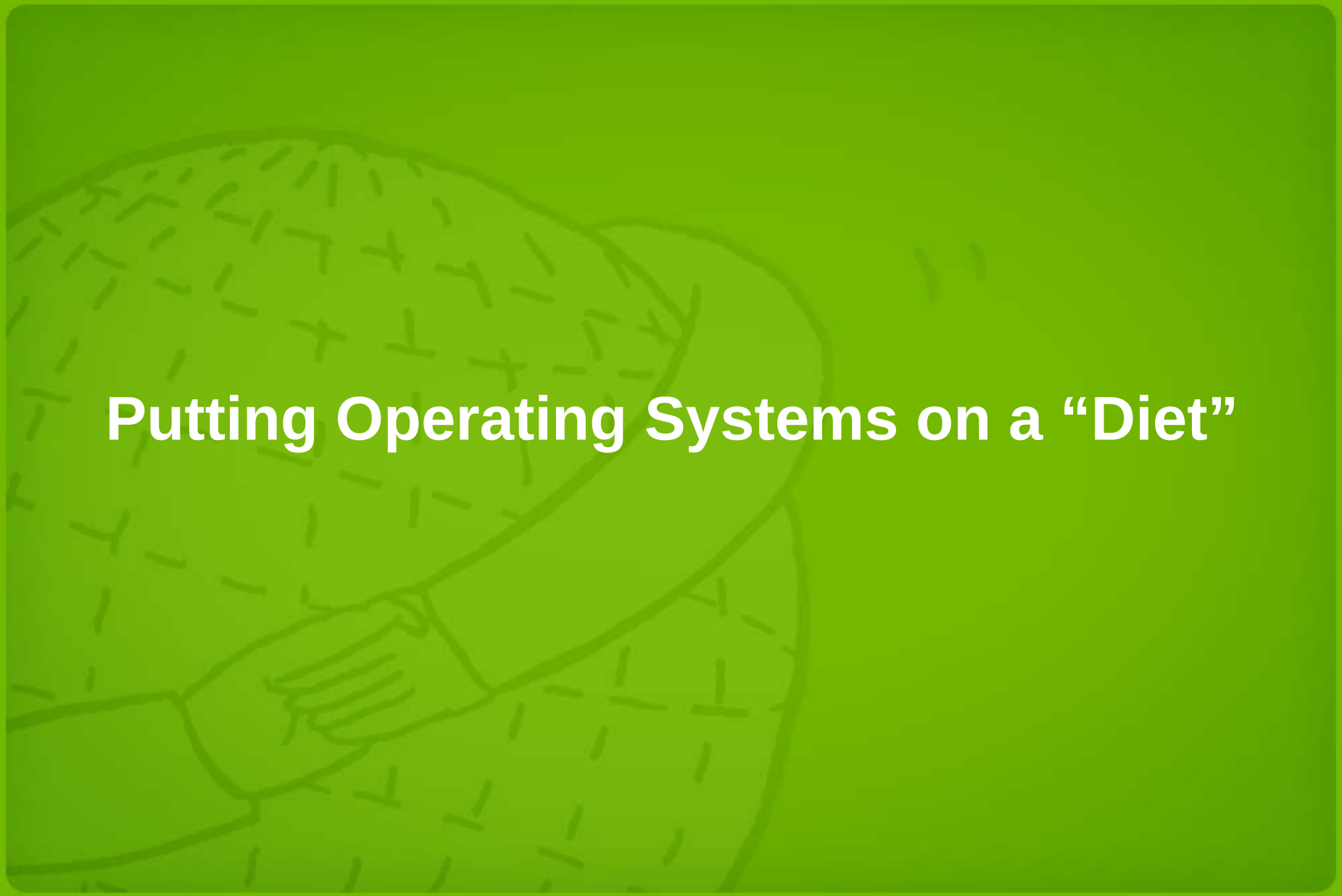
- Goal: *Support as many applications as possible*



Modern OS 'Evolution'

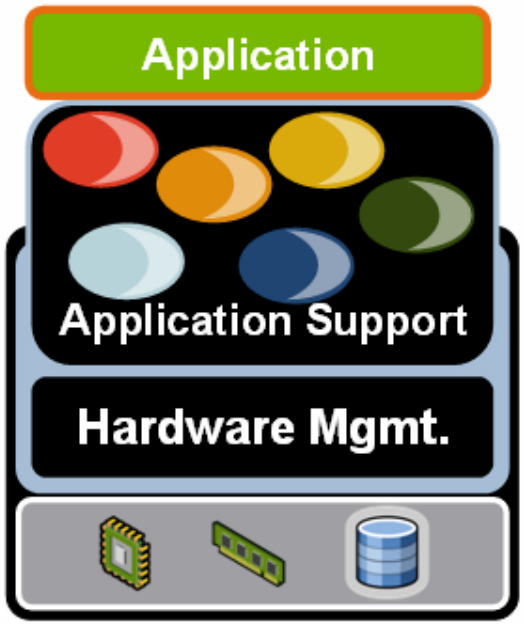


- **Goal:** ***Support as many applications as possible***
- **Result:** ***Complex, bloated OSes; issues with***
  - Security
  - Reliability
  - Manageability
  - Performance
  - Innovation



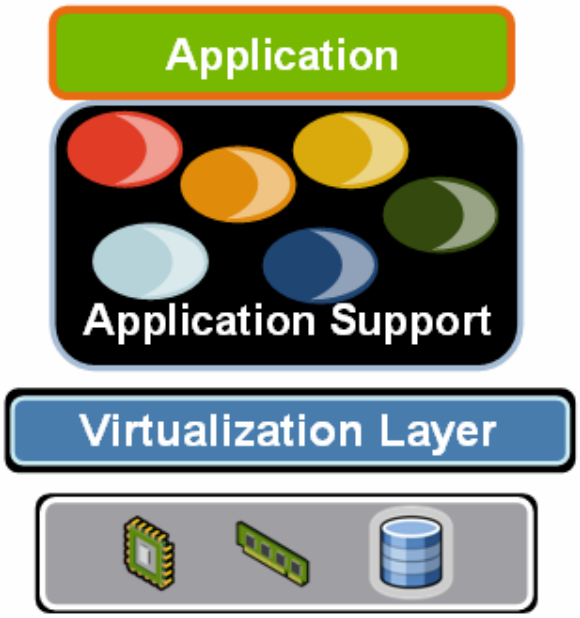
Putting Operating Systems on a “Diet”

Virtual Appliance Operating Systems



- Don't need complex hardware management
- Don't need broad application support
- Application-specific tuned operating system (JEOS)
- Look at hardware appliance operating systems for examples
- Take the positives of hardware appliances and software without the drawbacks

Virtual Appliance Operating Systems



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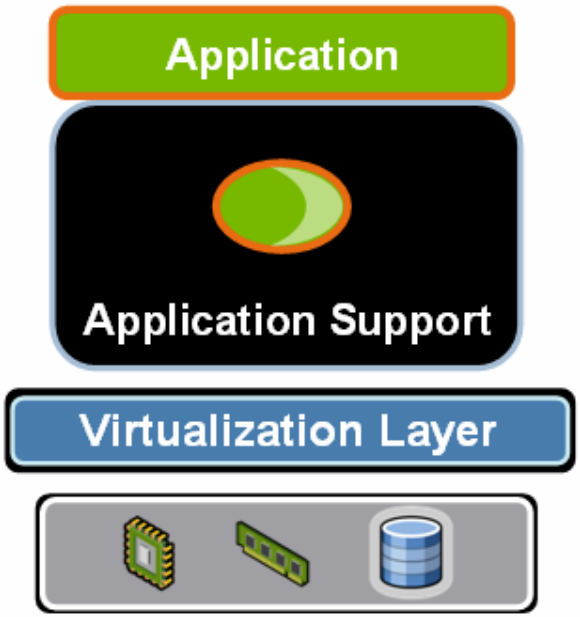

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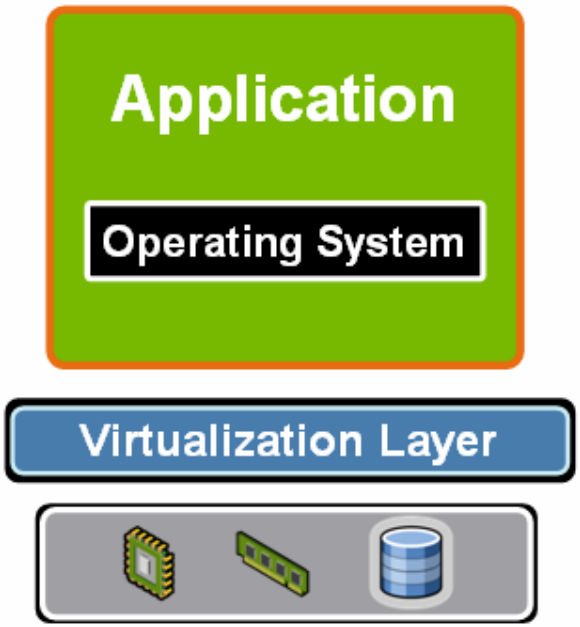

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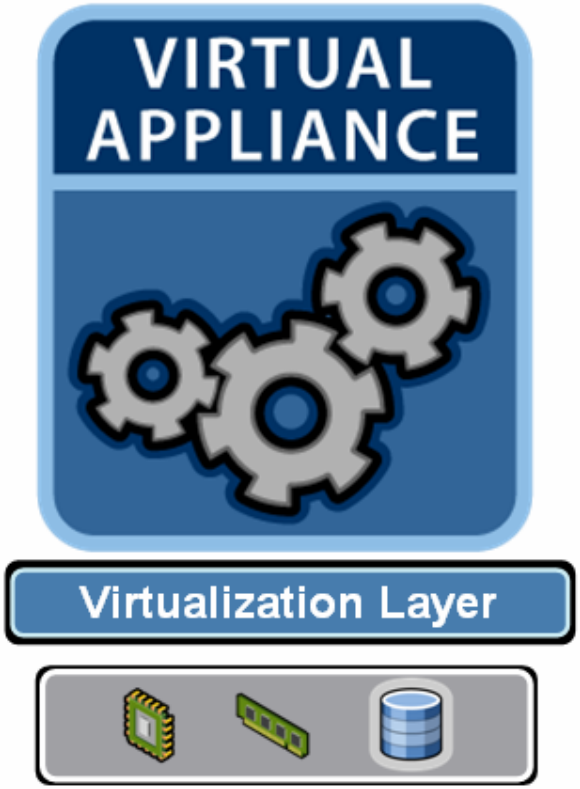

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Best Practices for Designing Virtual Appliances

Best Practices: Design

- **Completely Encapsulated for Distribution**
  - Contains all of the services required to configure and run the solution
  - Limited or no access to underlying OS
  - Installed inside one or more VMware Virtual Machines
- **Built on “Just Enough OS” (JEOS)**
  - Build up from a kernel or pare down from a standard OS distribution
  - 3rd Party: Use tools, frameworks and/or services to build a tailored OS distribution
  - nliteos.com (for Windows)
- **Downloadable**
  - Packaged with the smallest footprint possible
- **Updatable**
  - Allows users to perform connected or disconnected updates to patch entire appliance (including OS)

Best Practices: Automating Builds and Tests

- **Rapid turnaround for OS and Application updates**
  - Fastest security response
  - Eases partition/appliance image replacement upgrade paths
- **Integrate with your existing software build system**
- **Build several appliance variants**
  - Large footprint SMP
  - Small footprint Uniprocessor
  - i686 and x86_64 builds
  - Reduced feature evaluations
  - Direct build to automated test

Automated Build Resources

- **Use VMware scripted APIs**
  - VIX for VMware Workstation 6.0.1, VMware Server 1.0
    - Bundled with supported VMware products
  - VIM for VMware ESX Server and VMware VirtualCenter
    - http://sourceforge.net/projects/viperltoolkit/
  - VMTM Discussion Forums offer quick answers to common challenges
- **Use unattended network installs**
  - kickstart, autoyast, and others
  - VMware virtual network devices support PXE
  - Compile static IP data into etherboot floppy images if DHCP use is prohibited
  - The install configuration file defines the minimal OS components

Create the Virtual Appliance

1. **Start with a new VM**
   - Use SCSI disks for portability
     - Split Disks into 2 GB files
     - Create with the *vmware-vdiskmanager* utility
     - LSI SCSI Controller for Linux 2.6 kernels
   - Allocate ideal required memory (clearly document this)
   - Disable snapshots, do not include snapshot files
   - Remove unused hardware devices
     - Bundle ISO/floppy images or start disconnected
   - Disable ‘Shared Folders’, Drag-n-drop, copy/paste
   - Avoid using Serial and Parallel ports or other specialty features
   - Choose proper network type (‘Bridged’ is the most common default)
   - Set Power On, Off, Suspend and Restart to Guest controls

Install the Operating System

2. **Install "Just Enough" of the OS and your Applications**
   - Choose the VMware HCL compliant OS of your choice
   - Minimize the footprint of the OS
     - Only install and run necessary services
     - Use a firewall, expose rules to the customer
     - Create a swap file at first customer boot instead of at build time
   - Install VMware Tools
     - Improved performance, optimized drivers, host communications and more
     - Hooks to management tools
     - Fully redistributable inside Linux guests
   - Include or enable users to add a second virtual disk
     - Split application and user data to different disks
     - Populate second disk at first customer boot

First Customer Boot

3. **Flag the Virtual Appliance for the first customer boot**
   - Test the minimum RAM specification
   - Populate the 2nd disk, create a swap file or partition
   - Reconfigure local services for available RAM, CPU counts
   - Utilities to Configure the OS and Applications
     - Console Experience
       - language (units & formats too), keyboards, NTP servers
       - Accept EULA
       - ‘Zero-configuration’ networking: DHCP with static IP options
       - Present management interface URL
     - Web Management Interface
       - Configure advanced networking (firewall, routes, multiple IP addresses)
       - Configure security (updates, certificates, access controls)
       - Monitor and manage performance of solution

Value-Added Services

4. **Provide additional value-added services as appropriate**
   - Expose logging from all underlying services in a consolidated form
     - Provide web-based log viewing/filtering/searching and management (export, purge) facilities
     - Allow users to send logs to remote syslog server
   - Support SNMP for remote management
     - Create MIB's for management functions, send traps on alerts
     - Support interrogation of status (get vs. set)
   - Provide audit hooks for enterprise change management
     - Web or console based manifest of installed and running applications
     - Access control logs (who logged in, from which IP, when, etc)
     - Consider revision control for configuration files
   - Backup & Restore configurations, data
     - Consider consolidating installation, upgrade, and backup utilities

Make the Virtual Appliance Available to Users

5. **Package your virtual appliance**
   - Copy your appliance to a new directory
   - Remove any unnecessary files
     - log files, nvram files, etc.
   - Add your ‘Getting Started Guide’ or ‘Read Me’ file to the directory
     - Include documentation for how to setup your appliance on VMware ESX Server
   - Compress the entire directory
     - 7-ZIP and RAR compress disks very well
     - Use compression technology that is cross-platform or create separate packages for Windows and Linux users
   - Create a web page to host your virtual appliance download
   - Certify your virtual appliance
   - Create a listing on http://vam.vmware.com

Patching and Updates

6. **Provide ongoing updates for your virtual appliance**
   - Leverage native provisioning utilities **OR** build your own
   - Provide updates to your virtual appliance
     - *Build customer confidence and trust!*
     - Release security fixes in a short, stated timeframe
     - Use update and security notification lists
   - Support online updates from your servers with HTTP proxy
   - Support offline patching for isolated & test network deployments
     - Deliver the update package to the customer
     - Customer deploys update to the Virtual Appliance
   - Heartbeat monitoring for paid support and proactive security
     - Track active versions
     - Notify customers of missed updates, outages, and more

Clustering Appliances in a Virtualized Environment

- **Scaling beyond the 4 socket server**
  - For more RAM and additional IO performance
  - Fragment datasets to scale to multiple virtual machines
    - Reports generation
    - User pools
    - Customer data maintenance (how to handle a TB+ database?)
  - Dynamically scale your cluster with VMware API calls
    - Clone a node and update its configuration
    - Create a new cluster node from a Template
- **New path to version upgrades**
  - Add new version nodes, Retire old version nodes
  - Avoid upgrading any one Virtual Appliance, let the data be persistent!

Tools, Frameworks and Services

- **VMware Virtual Appliance Development Kit**
  - Used as the basis for the ACE 2.0 Management Server Virtual Appliance
- **rPath rBuilder**
  - Web-based virtual appliance development tool
  - Includes its own rPath Linux distribution
  - Includes its own patching solution
- **VirtualAppliances.net**
  - Service provider
  - Developing their own framework
- **JumpBox**
  - Service provider

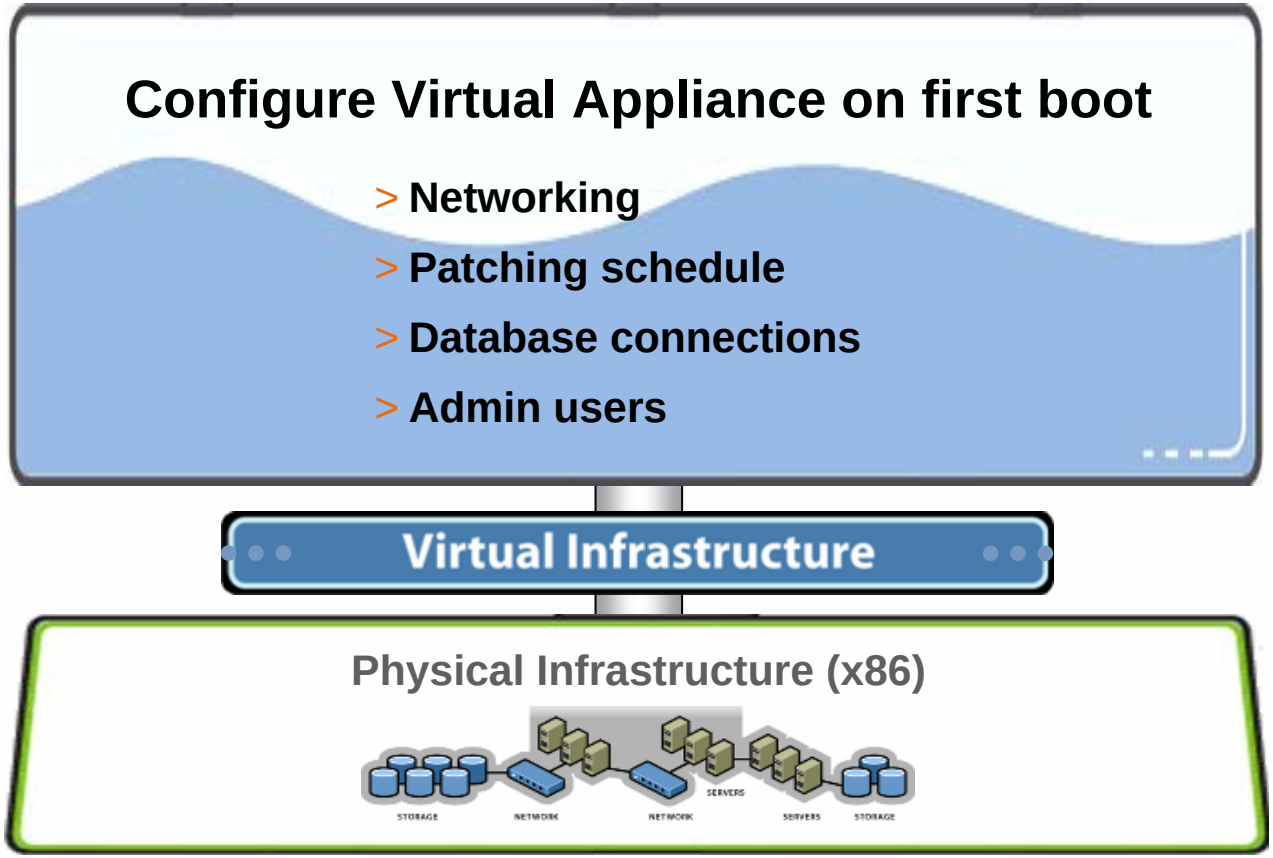
DEMO

ACE 2.0 Management Server Appliance

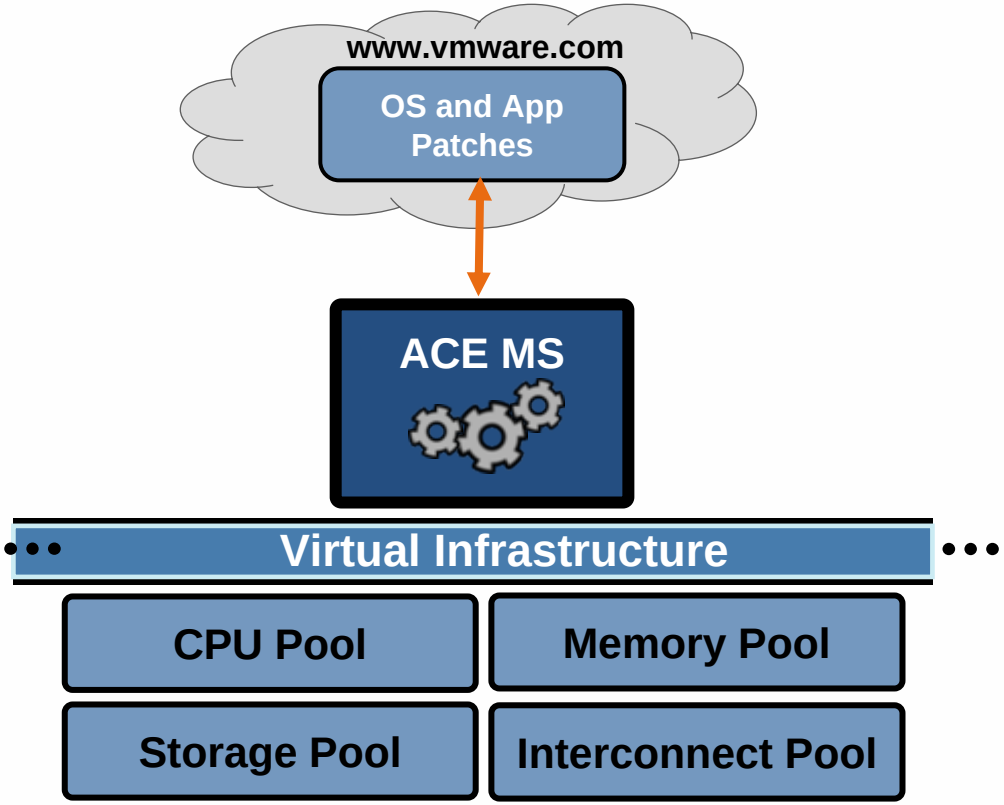
Virtual Appliance Example: ACE 2.0 MGMT

- **VMware ACE Management Server is available as a virtual appliance**
- **Appliance consists of:**
  - Just enough OS (JEOS)
  - Apache/PHP
  - Mgmt UIs to configure appliance on first boot and thereafter
  - Patching module to check and download patches
- **43 MB zipped**
- **Fully supported by VMware**

Deploying the ACE Management Server



Patching the ACE Management Server



1. If security fix is required for JEOS, VMware downloads fix from OSV
2. VMware rolls up OS and app fixes, tests and uploads patch
3. Appliance checks www.vmware.com for updates
4. If patch available, appliance downloads it automatically
5. Admin installs patch or appliance patches itself

Questions?

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For more information…
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See the Virtual Appliances Best Practice Guide at:
http://www.vmware.com/appliances/learn/

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