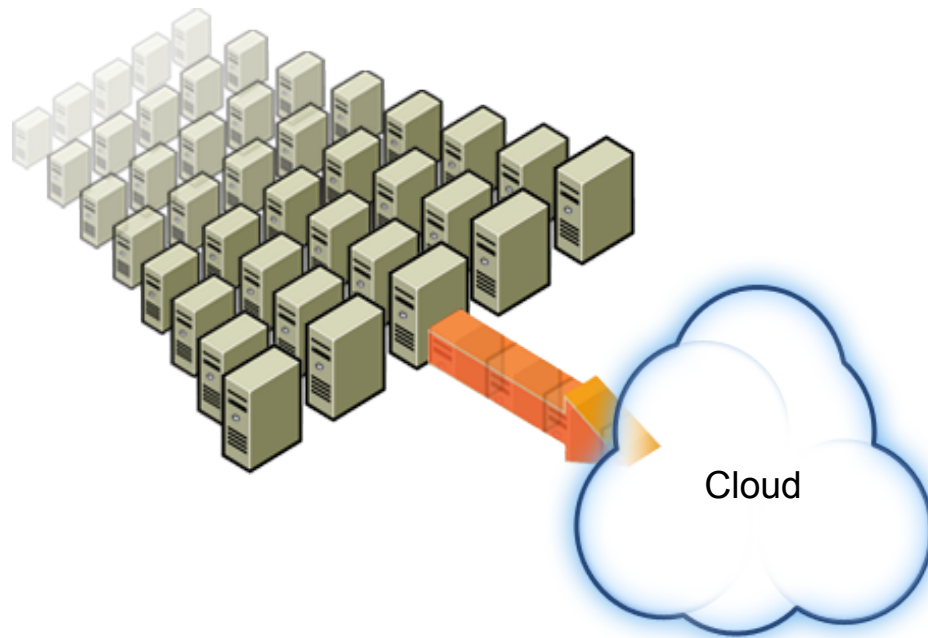


Virtualization is the Operating System of the Cloud

René W. Schmidt
Principal Engineer
VMware, Inc.

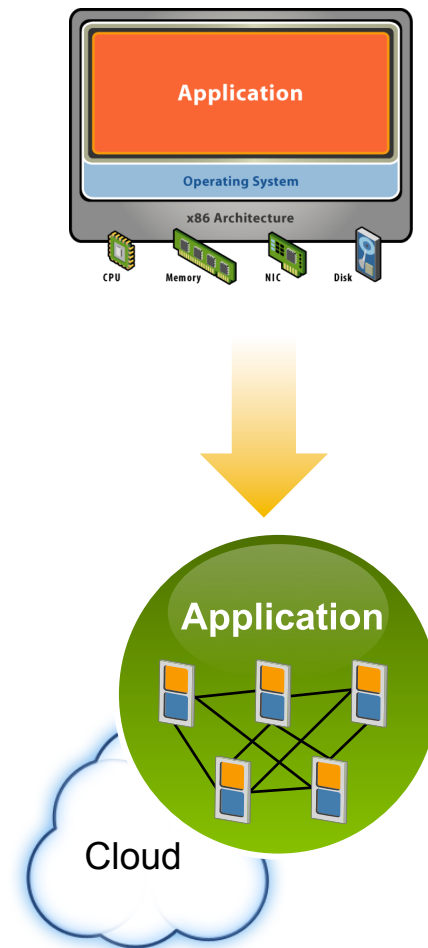


Agenda

- 
- **Virtualization Primer**
 - **Cloud Computing Defined**
 - **VMware vCloud Initiative**
 - **Cloud Application Architecture**
 - **Conclusions**

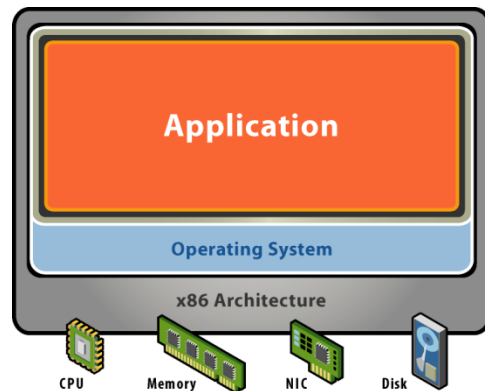
What this is really about...

- **Requirements of today's software:**
 - Massive Scale
 - Always On
 - Flexible / SOA
 - Fast development cycles
- **Thus:**
 - Complex to deploy
 - Complex to manage
 - Complex to update
 - Complex to test
 - Complex to size
- **Driving two major areas of innovation:**
 - Application Architecture (e.g., Web 2.0 frameworks)
 - Deployment Infrastructure (e.g., Cloud infrastructure)

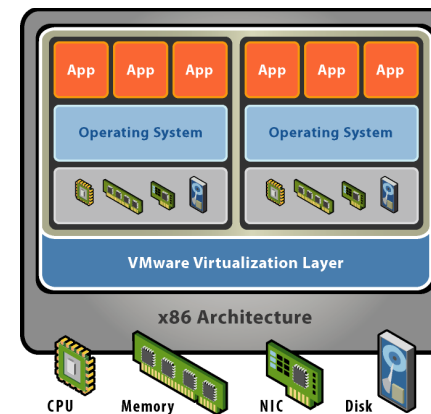


What is Virtualization?

Without Virtualization



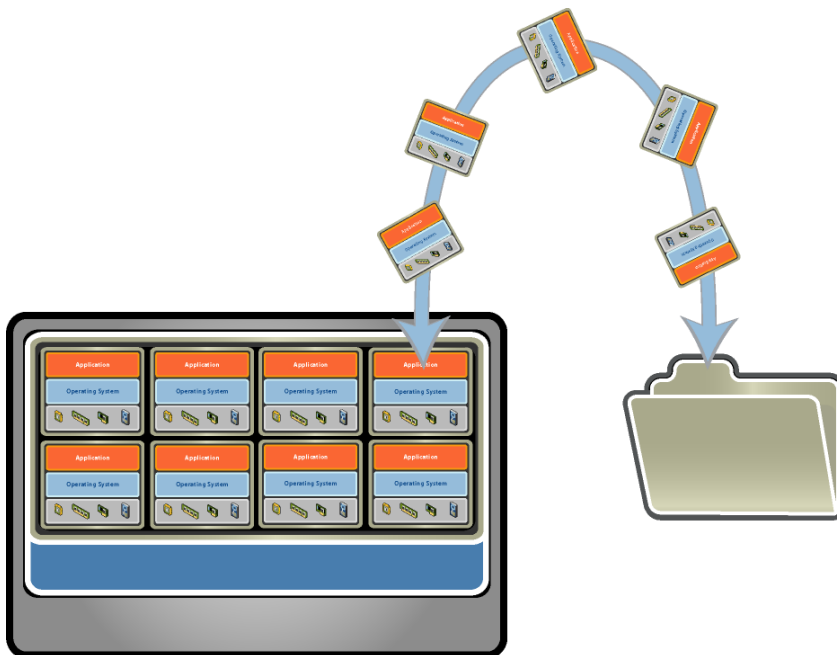
With Virtualization



- Virtualization presents a complete x86 platform to the virtual machine
- Allows multiple application stacks to run in isolation within VMs on the same physical machine
- Uniform virtual hardware layer – independent of underlying physical hardware

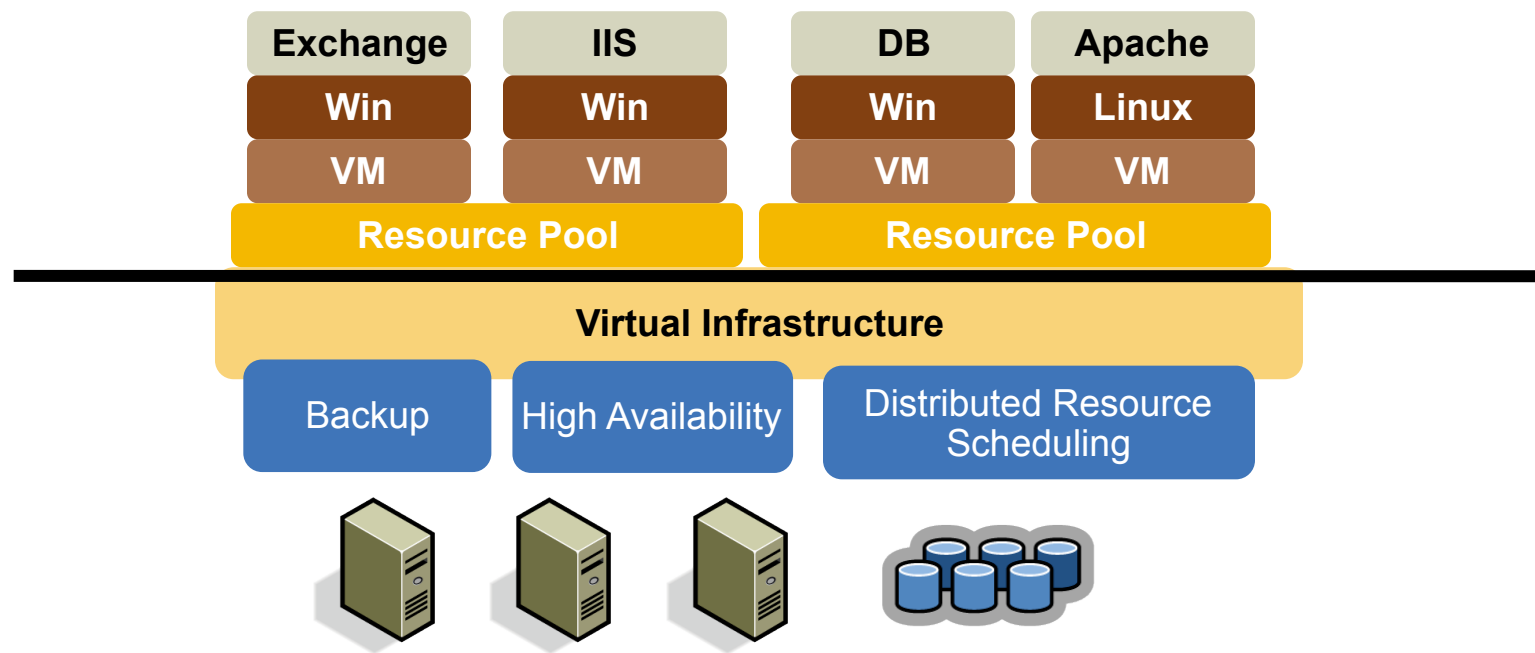
Virtual Machine as a Container

- Entire server – OS, apps, data, devices, and state – is now simply a file
- Enabled by uniform virtual hardware and state encapsulation
- Provisioning is similar to copying a file
- Standard data management techniques are used for server management
 - Server cloning/copying
 - Remote mirroring
- Virtual Appliances
 - Distributing software in VMs



Virtual Infrastructure

- Transforms discrete physical infrastructure into a flexible pool of resources
- Legacy friendly
- Application-level services



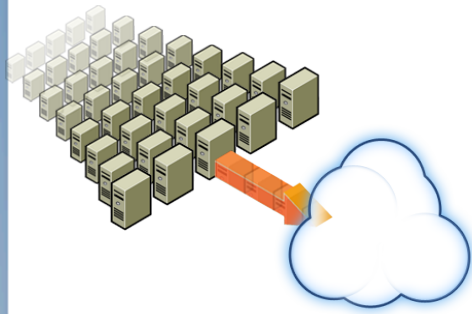
Virtual Machine as a Compute Engine

- **A VM is an encapsulation of compute capacity**
 - CPU / Memory / Storage / Networking / Software
- **A VM can be created programmatically**
 - Can be instantiated in a cluster
 - Transparently be migrated depending on load and capacity
- **Next evolution in core OS abstractions**
 - Thread / Process / Virtual Machine
- **Enables new software architectures**
 - Create self-scaling distributed applications

Virtualization Status

- **Has fundamentally changed the economics in datacenter operations**
- **Hardware Management:**
 - Higher server utilization
 - Easier to maintain physical infrastructure
- **Software Management:**
 - Pre-built templates that can be provisioned in seconds
 - Ability to create new VMs in seconds for test and development
 - Backup, Security, Disaster Recovery, Monitoring built in at the virtualization layer

How Do We Define The Cloud?



Cloud Computing according to VMware

- **Lightweight entry/exit service acquisition model**
- **Consumption based pricing**
- **Accessible over standard internet protocols**
- **Scalable and elastic**
- **Improved economics due to shared infrastructure and elasticity**

“ Cloud computing comes into focus only when you think about... a way to increase capacity or add capabilities on the fly without investing in new infrastructure, training new personnel, or licensing new software. Cloud computing encompasses any subscription-based or pay-per-use service that, in real time... extends IT's existing capabilities. ”

 **InfoWorld**

Different Types Of Cloud Computing

APPLICATION AND INFORMATION

Sometimes referred to as Software-as-a-Service, a wide ranging services delivered via varied business models normally available as public offering.



salesforce.com[®]
Success On Demand.

Expedia.com[®]

Google[™]

Two Main Deployment Environments

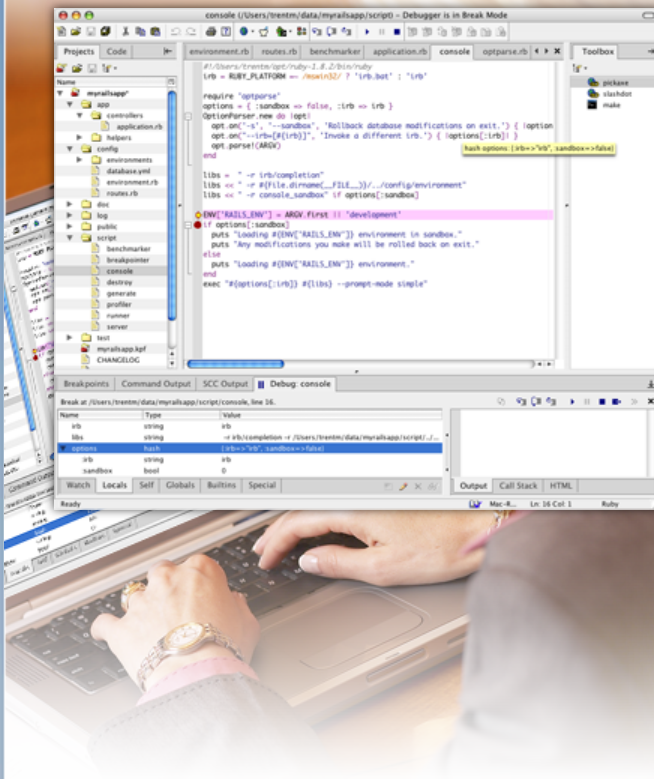
Public – Accessible over the internet for general consumption

Private – Behind corporate firewall for use by limited, pre-determined audience

Different Types Of Cloud Computing

DEVELOPMENT

Sometimes referred to as Platform-as-a-Service, application development platforms enable application authoring and runtime environment.



Two Main Deployment Environments

Public – Accessible over the internet for general consumption

Private – Behind corporate firewall for use by limited, pre-determined audience

Different Types Of Cloud Computing

INFRASTRUCTURE

Sometimes referred to as elastic compute clouds or Infrastructure-as-a-Service, virtual hardware made available for varied uses.

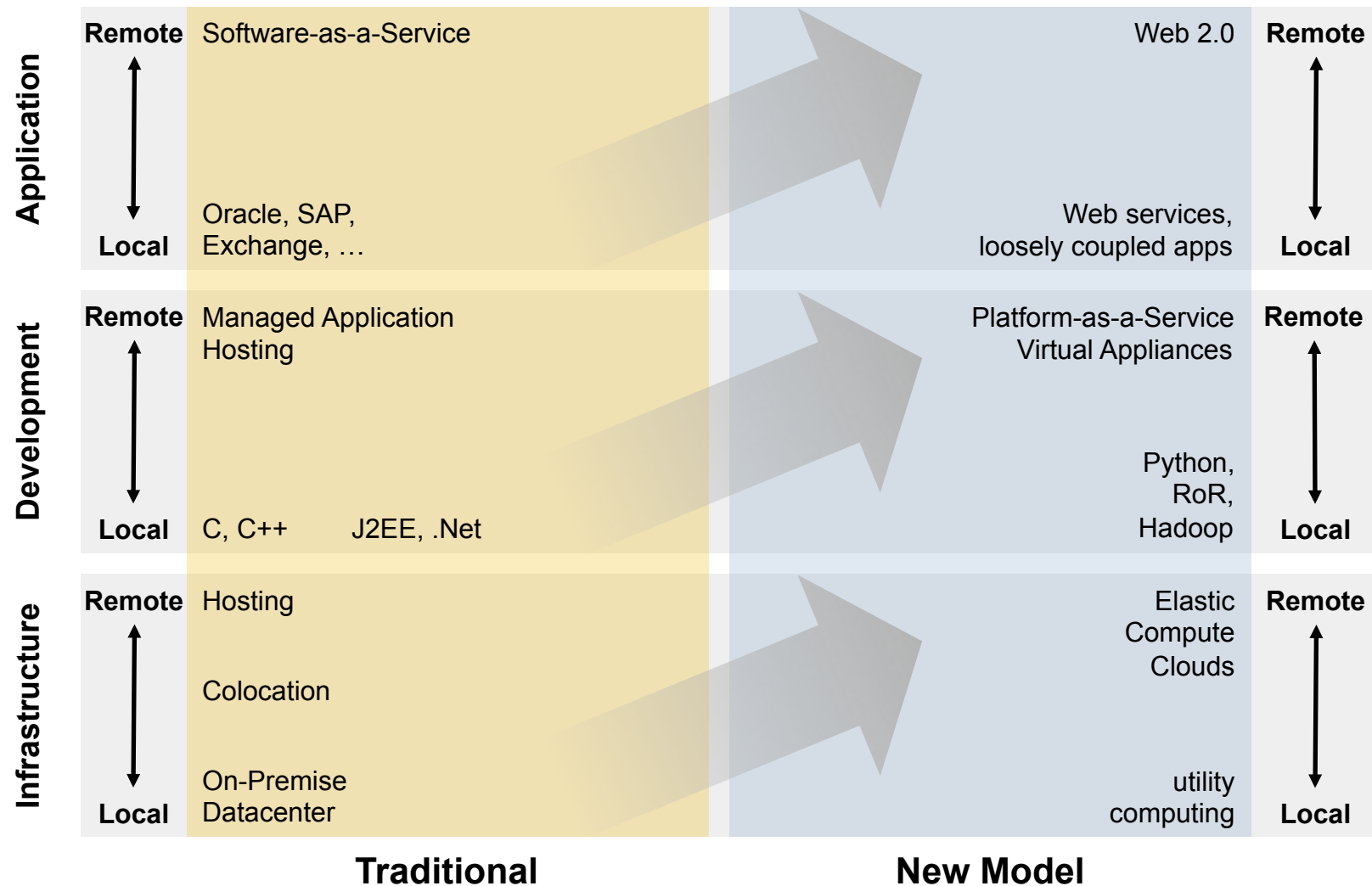


Two Main Deployment Environments

Public – Accessible over the internet for general consumption

Private – Behind corporate firewall for use by limited, pre-determined audience

Map Of Cloud Computing



Key Industry Trends

Cloud Platforms

- **Business cycle times shortening and driving needs for highly elastic infrastructure**
- **Traditional Hosting Service Providers and Compute Clouds becoming more similar**
- **Intelligence moving from hardware into software**
- **Cheap server revolution!!**

Application Architectures

- **Operating Systems “thinning down” thus enabling better transportability**
- **More diversity in Operating System use**
- **Applications becoming disaggregated, distributed set of services**
- **Growing proliferation of consumer Web 2.0 consumer apps on cloud platforms**
- **Fault tolerance built into the application or virtual hardware layer**

Challenges Of Cloud Computing



- **Need for New, Highly Efficient and Flexible Computing Infrastructure**

- Must be highly performant
- Must be highly scalable
- Need new more coarse grained units of management and actions
- Needs to be elastic



- **Application Compatibility**

- Need application model optimized for cloud
- Need to leverage existing skills and code base
- Will not be 100% immediate transfer to cloud, need bridge
- Need better containers that allow for true application level operations
- Applications “sticky” to location

Challenges Of Cloud Computing

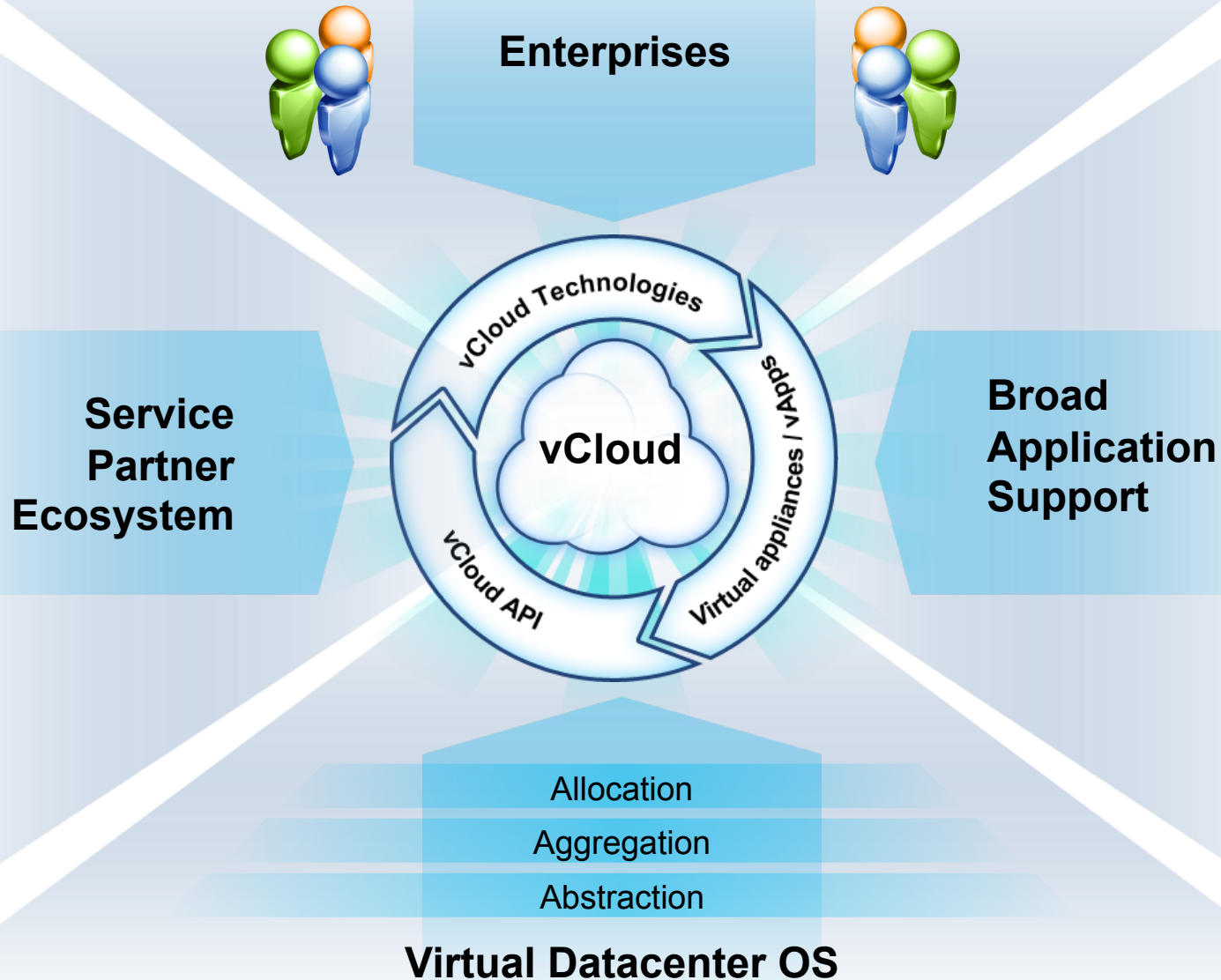


- **Lack of standardization creates complexity and switching costs**
 - Each compute cloud vendor has different application model
 - Proprietary, vertically integrated stacks limiting choice, increasing switching costs

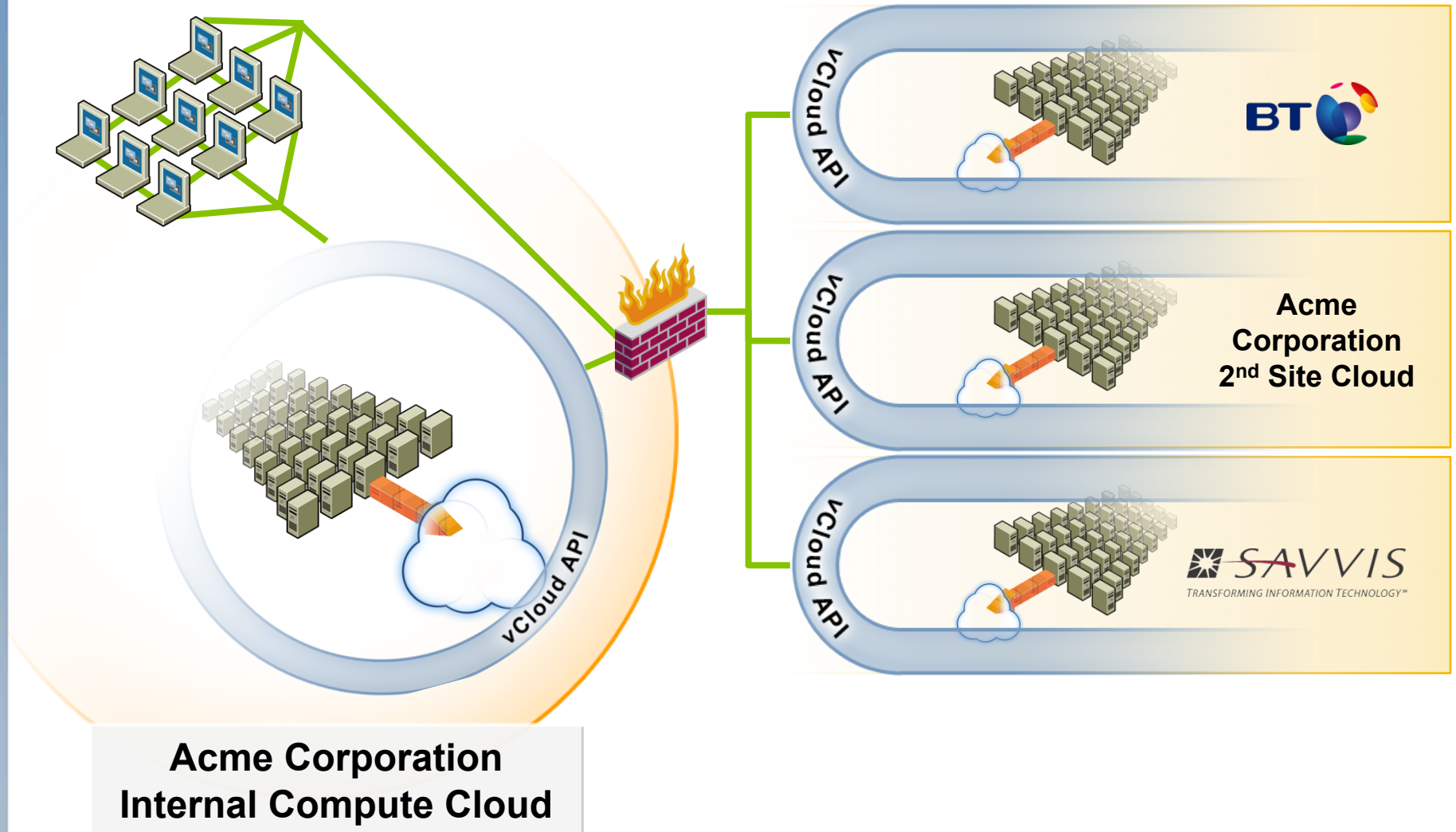


- **Multi-tenancy**
 - Need to find the balance between the security of dedicated infrastructure with economics of shared infrastructure
 - Service level agreements need to move to richer application level semantics

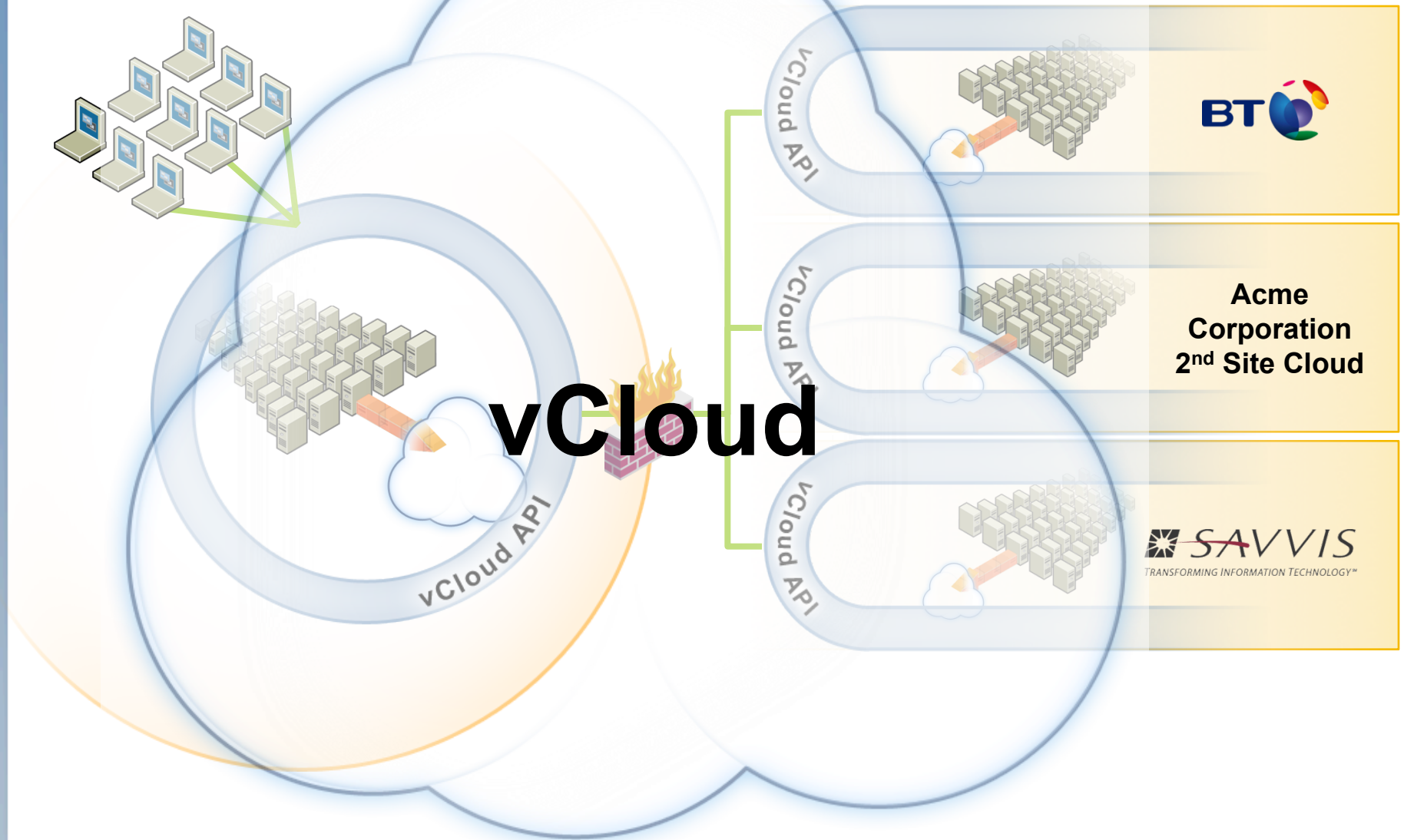
VMware vCloud Initiative



VMware vCloud



VMware VCloud



vCloud Components

- **Virtual Datacenter OS:**

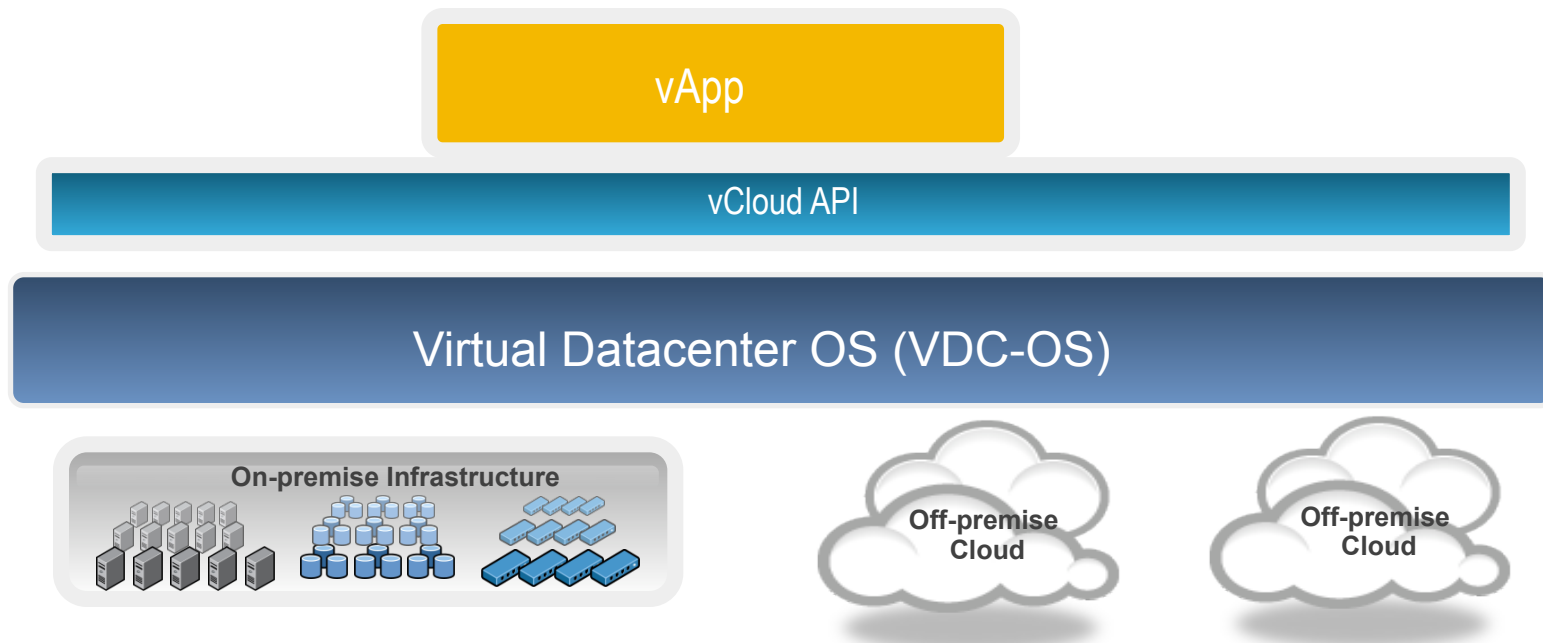
- A software platform that seamlessly aggregates on-premise computing assets into pools of capacity and federates federates with third party cloud infrastructure to deliver capacity on demand

- **vApp:**

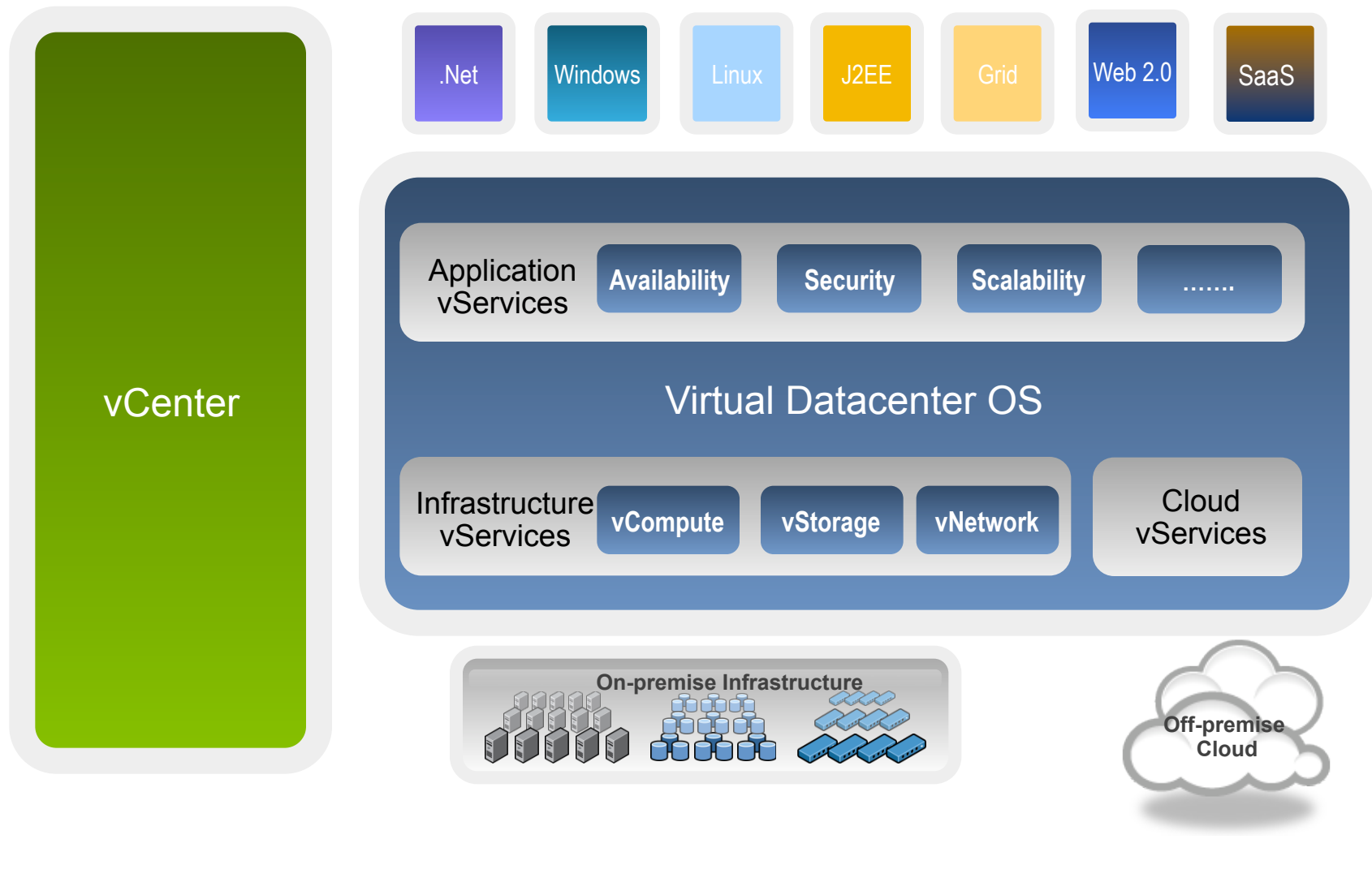
- A software solution that is optimized for VDC-OS. Can seamlessly move between on-premise and off-premise

- **vCloud API:**

- Provides access to the services provided by the VDC-OS



Virtual Datacenter OS (VDC-OS)



Consequences of a VDC-OS for application developers

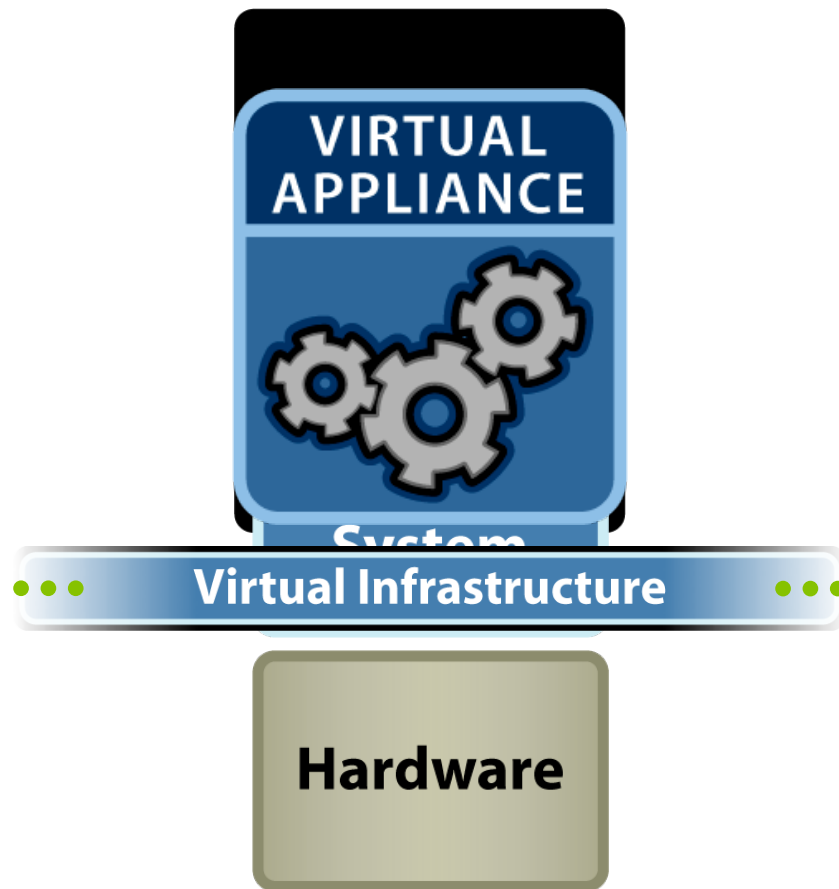
- **Independence of deployment environment**
 - Uniform hardware, One or many VMs, Any OS
- **Simplified Management**
 - A VM always comes with a support system
- **Scalability and Availability**
 - Ability to codify distributed application configurations and availability
- **Testing and Automation**
 - Easily instantiate many copies of complex software
 - Save snapshots for later debugging
- **Cloud Enablement**
 - Seamless move between on-premise and off-premise

vApps – Applications for VDC-OS

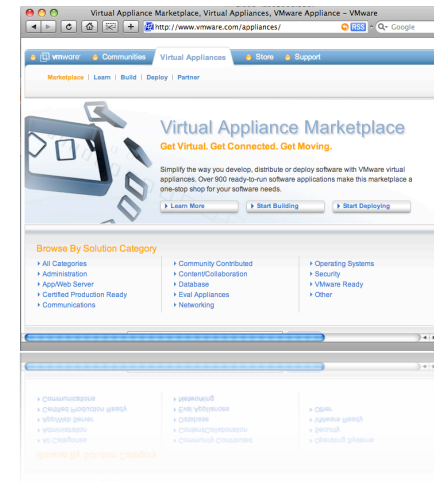
- Comprised of one or more virtual machines
- Packaged as OVF – Open Virtualization Format
- Policy Driven
- Integrates with underlying deployment infrastructure services



It started with Virtual Appliances

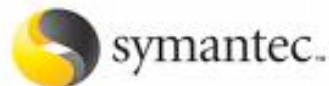


- **VMware created the category of virtual appliances 3 years ago**
- Prepackaged, pre-configured VM(s) with just enough OS – **jeOS**
- **850+ Appliances on Virtual Appliance Marketplace**



Open Virtualization Format (OVF)

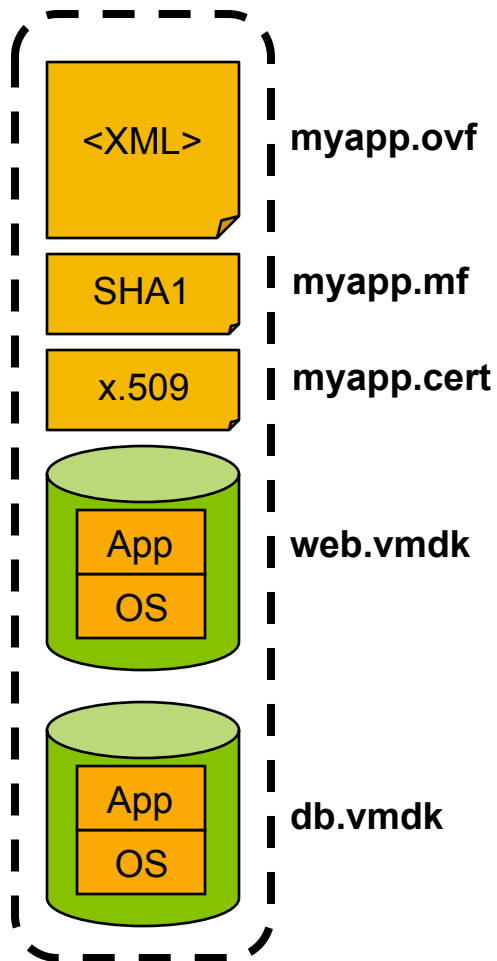
- **A standard for packaging and distribution of VMs**
 - A package format that provides a complete description of a single VM or complex multi-VM environments
 - Optimized for distribution
 - Infrastructure to securely and robustly install, configure, and run Virtual Appliances
- **Developed by DMTF working group**
 - Preliminary version 1.0 just published (September 2008)



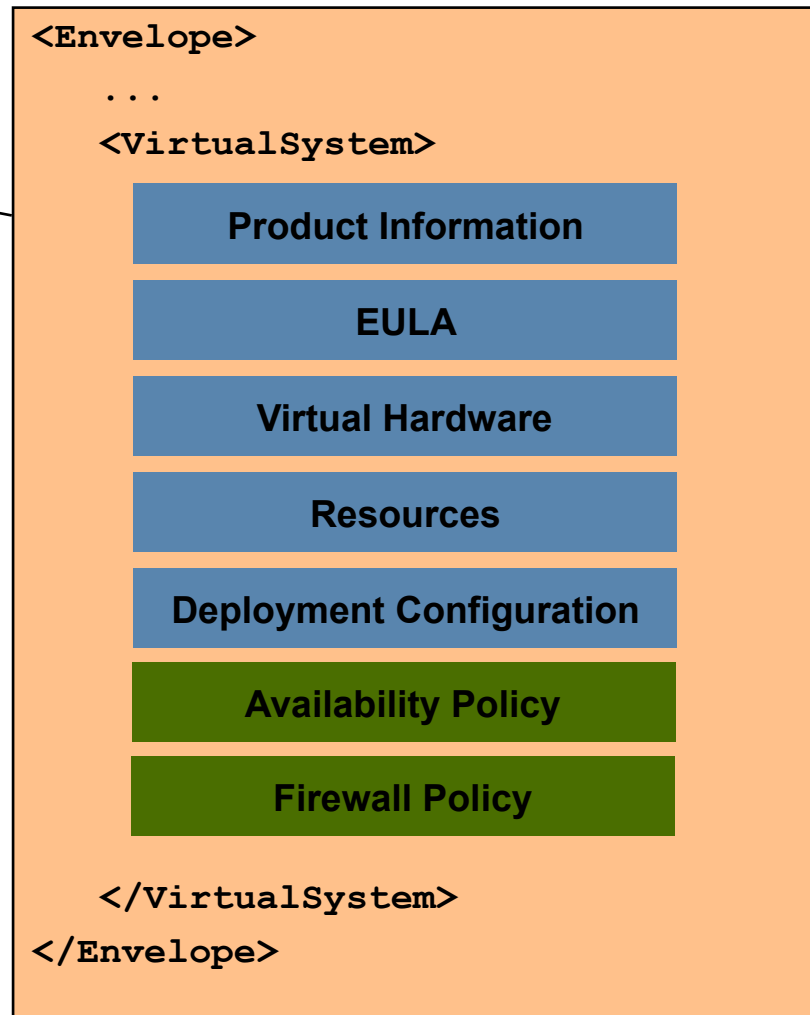
The OVF Specification

- **A Packaging Format**
 - How to bundle files and do digital signing
- **OVF Envelope**
 - An XML descriptor that describes the software in an OVF package
 - Organized as an envelope with an extensible set of sections
- **Core Sections**
 - 10 core sections for describing virtual hardware, EULA, Product information, etc.
- **OVF Environment**
 - An XML document available to the software inside a virtual machine which enables it to adapt to the deployment environment
- **Extensible**
 - Policy-meta data

OVF Package



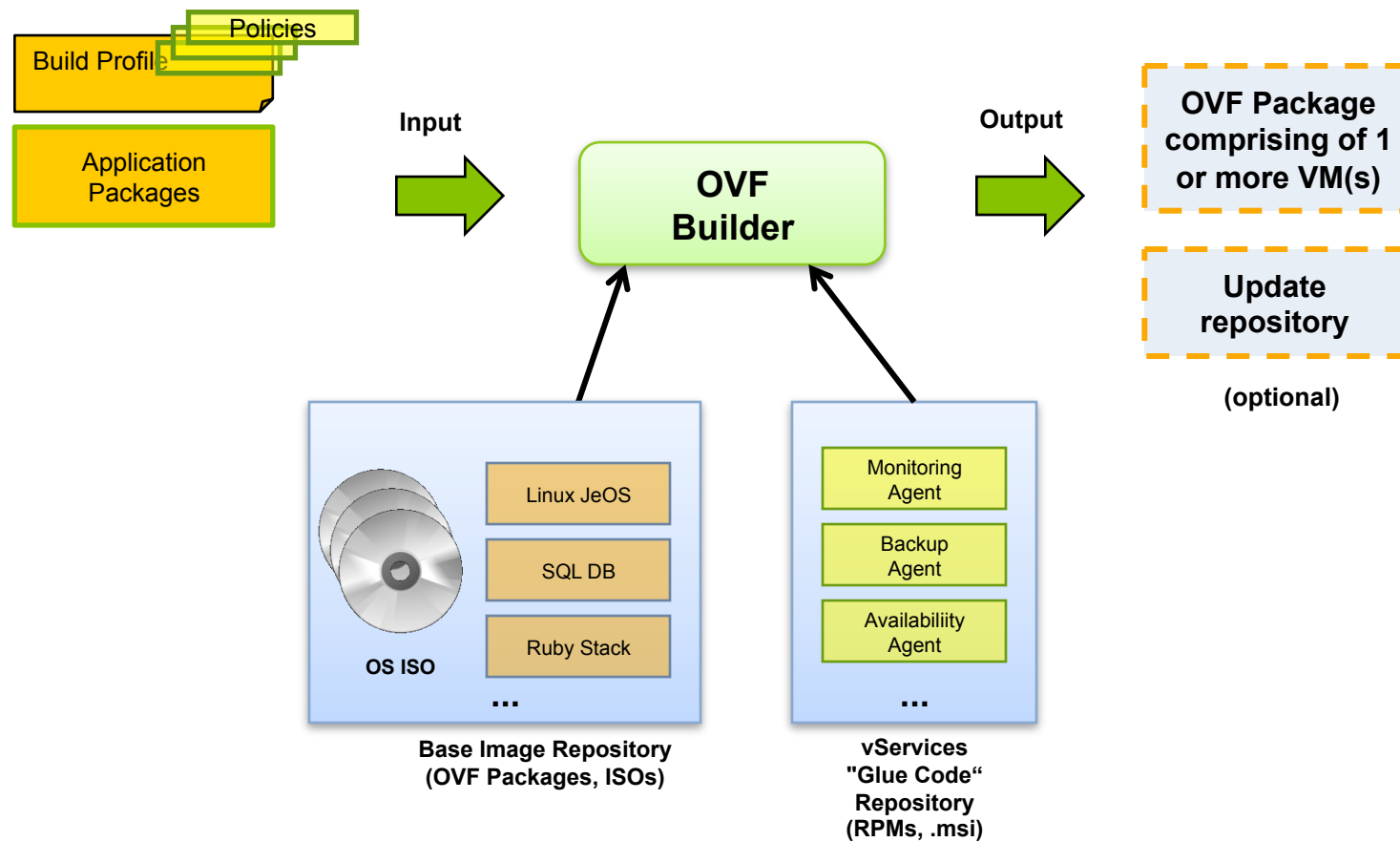
OVF Descriptor



vApp Workflow

- **Building a vApp**
- **Deploying a vApp**
- **Instantiating on a cloud provider**

Building a vApp



VMware Studio

- **Provide rich authoring environment for vApps**
- **Build Virtual Machines that are**
 - Highly customized
 - Easy to deploy, Require minimal setup
 - With rich meta-data and/or
 - Embedded in-guest “glue” code for runtime interaction with VI
 - Location independent

Enable on-going maintenance

- Build VMs that are capable of self-maintenance
- **Integrate into automated build systems**

Deploying vApp: Select Source

Import Virtual Machine Wizard

Select import method and import source
From where do you want to import the virtual machine?

Import Location

- VTN
- Virtual Machine Details
- End User License Agreement
- Name and Folder
- Resource Pool
- Properties
- Ready to Complete

Import an OVF package from the file system or a URL

☐ Import from Disk:

Choose this option to import a virtual appliance from the file system, for example your harddrive or CD drive.

☐ Import from URL:

Choose this option to download and install a virtual appliance from somewhere on the internet (e.g. <http://vmware.com/VTN/foo.ovf>)

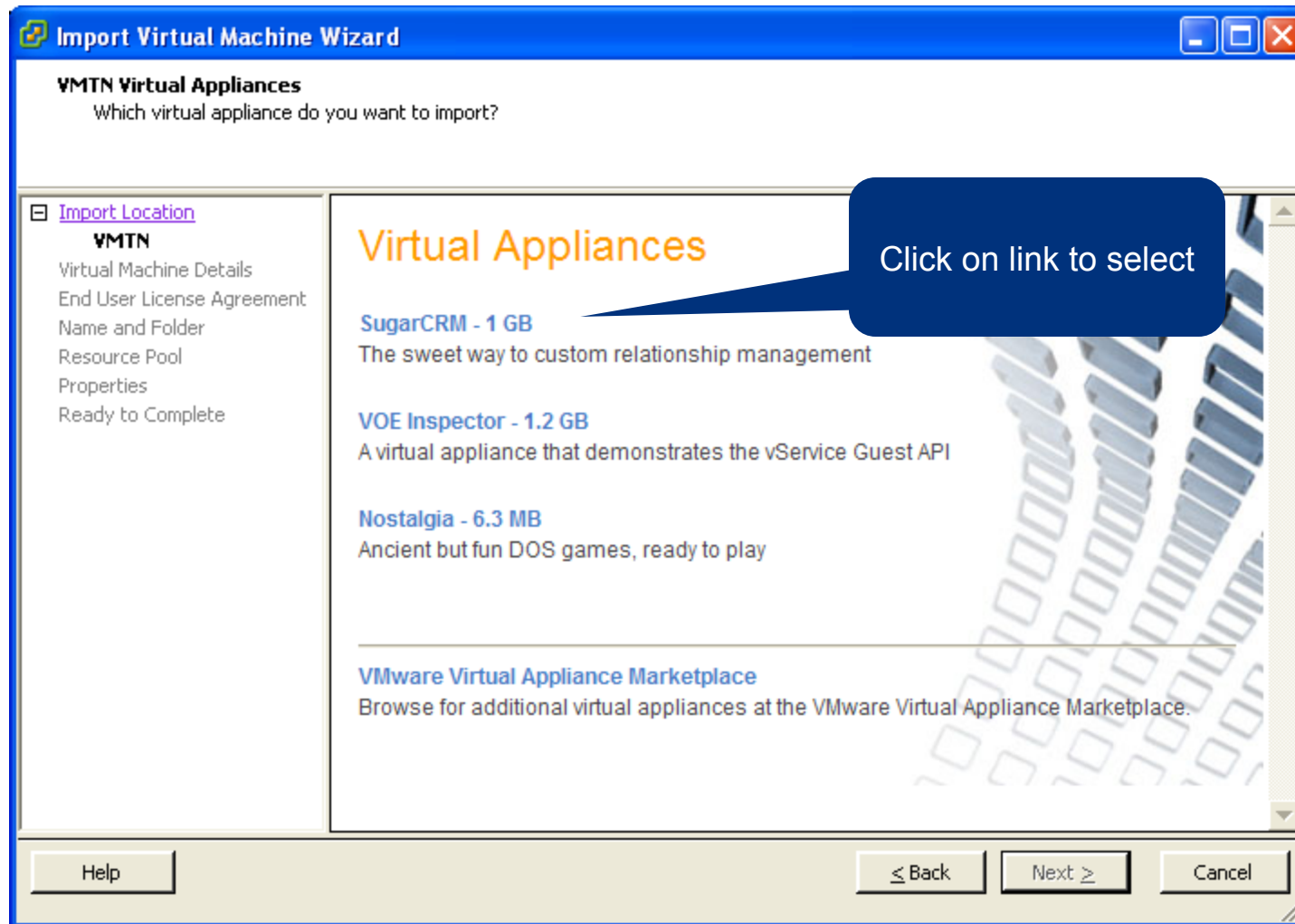
☒ Import from VMware VMTN:

Choose this option to browse virtual appliances that are available for download from VMware.

Help < Back Next > Cancel

Appliance can be stored on web server

Deploying vApp: VA Marketplace



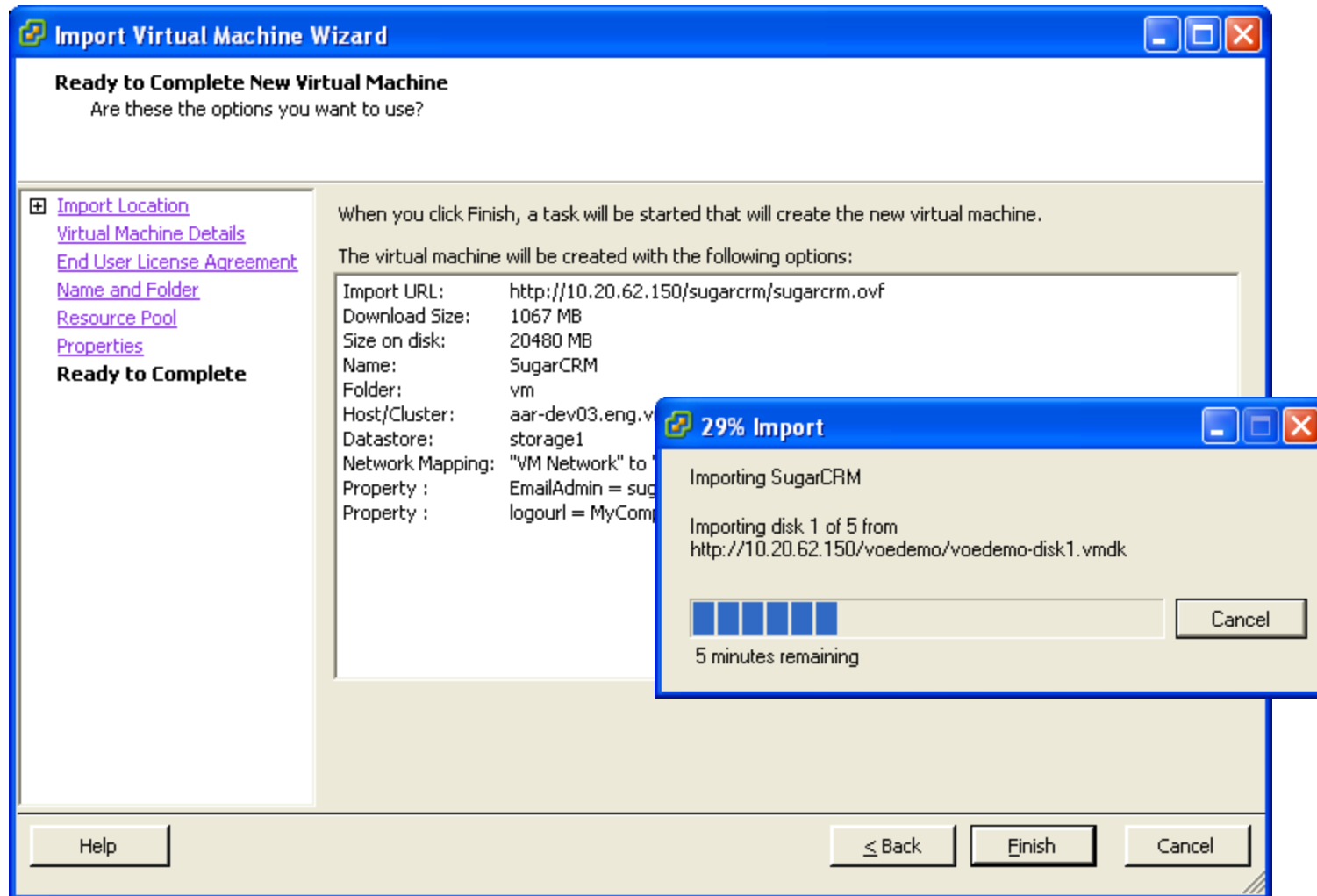
Deploying vApp: Product Information

The screenshot shows the 'Import Virtual Machine Wizard' window. The title bar reads 'Import Virtual Machine Wizard'. The main heading is 'Virtual Machine Details' with the question 'Do you want to import the virtual machine with the following settings?'. On the left, a tree view shows 'Import Location' expanded, with sub-items: 'Virtual Machine Details', 'End User License Agreement', 'Name and Folder', 'Resource Pool', 'Properties', and 'Ready to Complete'. The main area displays details for 'SugarCRM':

Name:	SugarCRM
Download Size:	1067 MB
Size on disk:	20480 MB
Description:	Sugar, the market leading commercial open source CRM application, delivers a feature-rich set of business processes that enhance marketing effectiveness, drive sales performance, improve customer satisfaction and provide executive insight into business performance. Supported by deep collaboration and administration capabilities that adapt to how your company operates, Sugar is delighting customers of all sizes across a broad range of industries.

At the bottom, there are buttons for 'Help', '< Back', 'Next >', and 'Cancel'. A blue callout bubble points to the 'Download Size' and 'Size on disk' fields with the text 'Validate before download'.

Deploying vApp: Download



vCenter Inventory

The screenshot displays the vCenter Inventory interface. The left pane shows the inventory tree with the following structure:

- Hosts & Clusters
 - VOE Demo
 - aar-dev03.eng.vmware.com
 - R&D
 - Demo Support
 - SugarCRM
 - sugarcrm-web-1.0
 - sugarcrm-db-1.0

The 'SugarCRM' vApp object is selected, and its details are shown in the right pane. The 'General' tab is active, displaying the following information:

- Service Status: Stopped
- Product: [SugarCRM VA](#)
- Version: 4.5.1e
- Vendor: [SugarCRM Inc](#)
- Description: Sugar, the market leading commercial open source CRM application, delivers a feature-rich set of business processes that enhance marketing effectiveness, drive sales performance, improve customer satisfaction and provide executive insight into business performance. Supported by

The 'Resources' tab shows the following usage:

- CPU usage: 0 MHz
- Memory usage: 0 MB

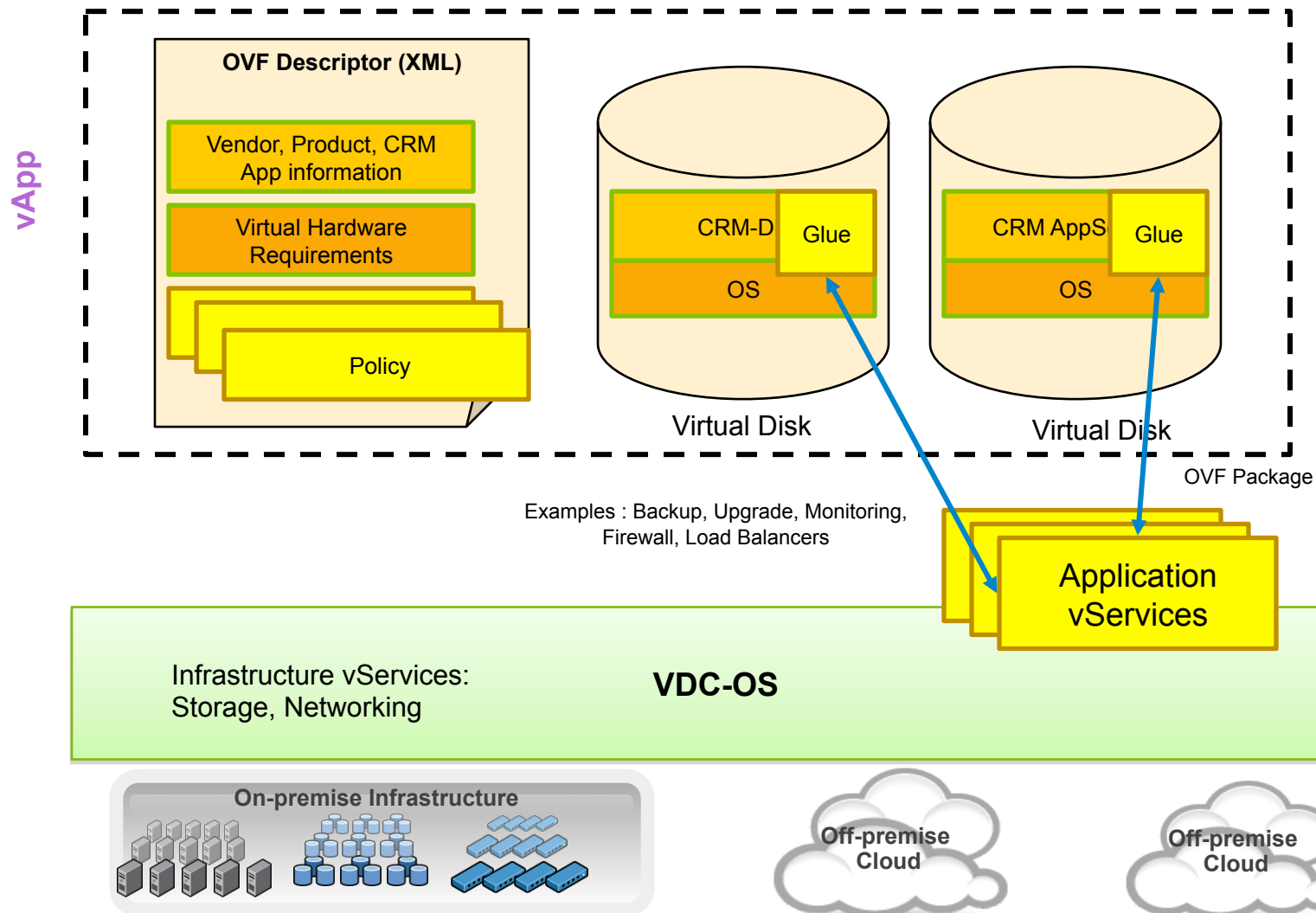
The 'Commands' tab shows the following actions:

- Start Service
- Stop Service
- Edit Service

Annotations on the image:

- A yellow callout bubble points to the 'SugarCRM' vApp object in the inventory tree, stating: "vApp object represents multi-tier SugarCRM application".
- A yellow callout bubble points to the 'Start Service' command, stating: "Power Operations Starts multi-tier service".
- A yellow callout bubble points to the 'Description' field, stating: "Application meta-data".

Putting it all together



Summary

- **The requirements for our software is changing**
 - Uptime, scale, flexibility, short cycle-time
 - New business models are emerging
- **Virtualization is fundamental to cloud computing**
 - A virtual machine is both a portable container and a compute engine for distributed applications
 - Embraces legacy, current, and future application work loads
 - Standards and eco-system
- **Cloud Computing is a cost-effective deployment platform**
 - Lightweight entry/exit service acquisition model
 - Consumption based pricing
 - Accessible over standard internet protocols
- **To Learn more: Visit us in our booth and on the Web**