Virtualization is the Operating System of the Cloud

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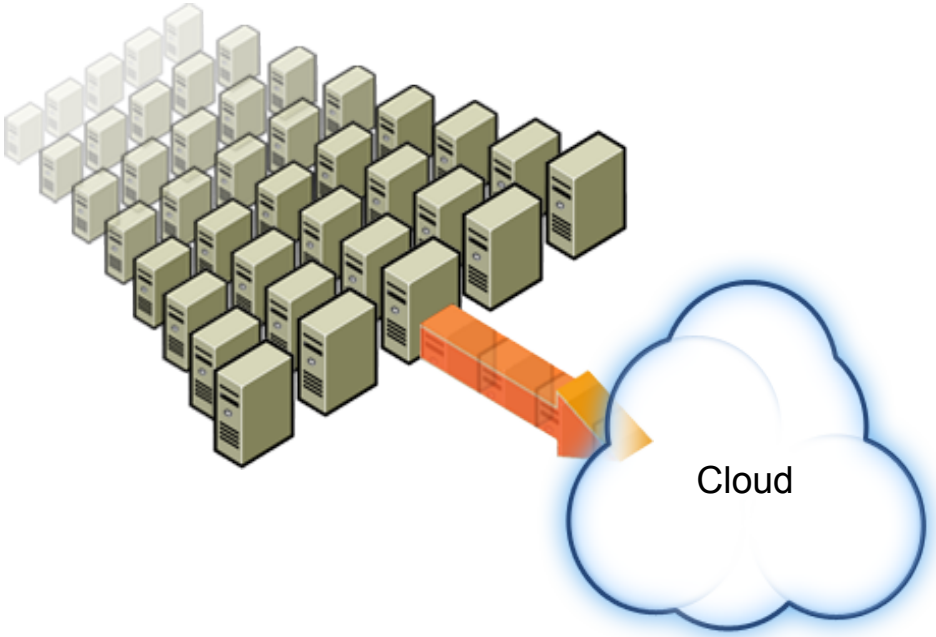
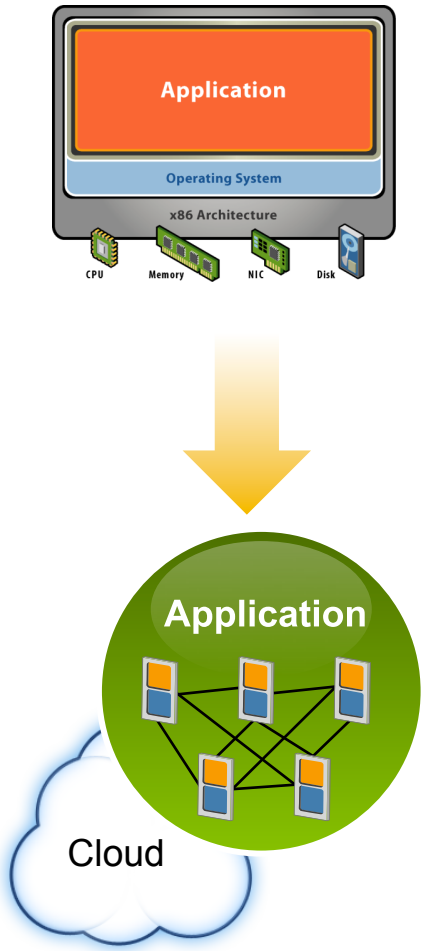


Agenda

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

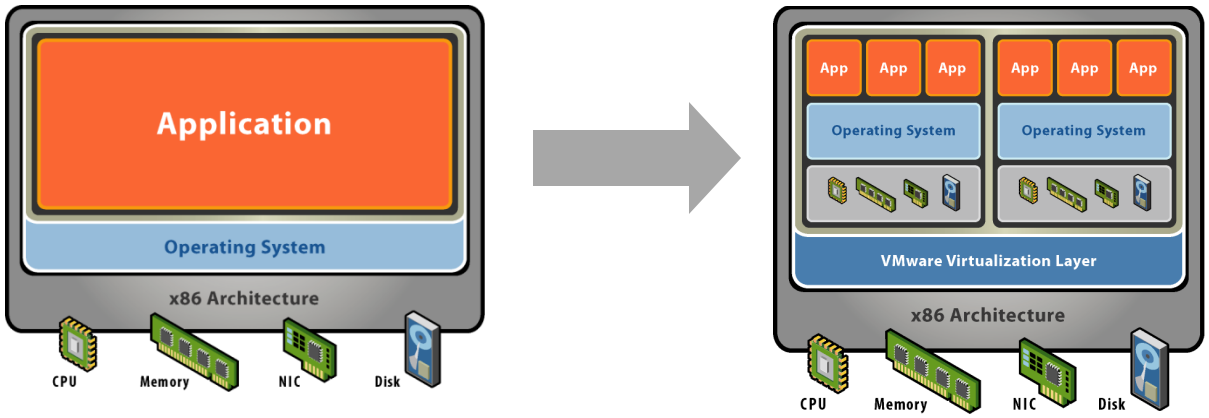
What this is really about...

- **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?

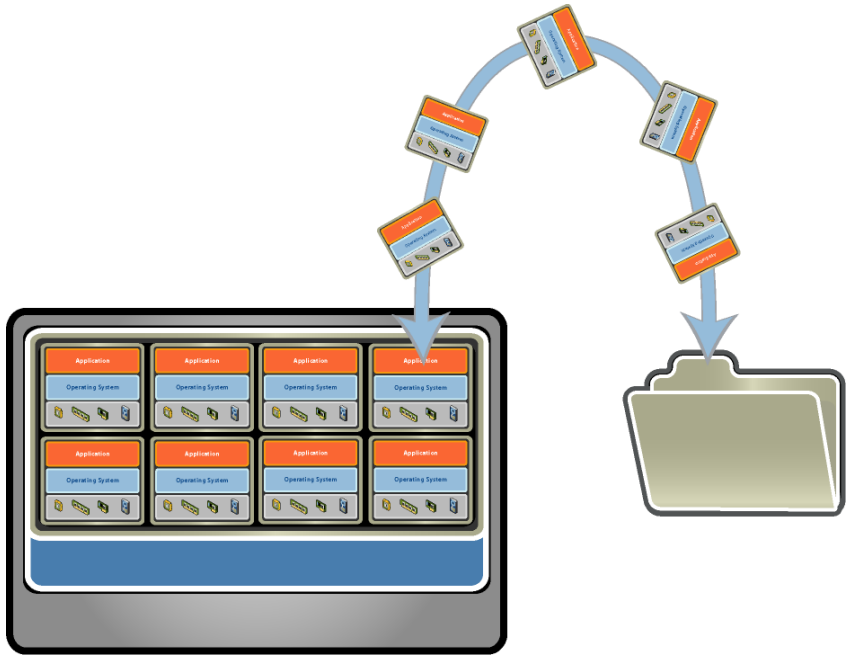
Without Virtualization **With Virtualization**



- 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

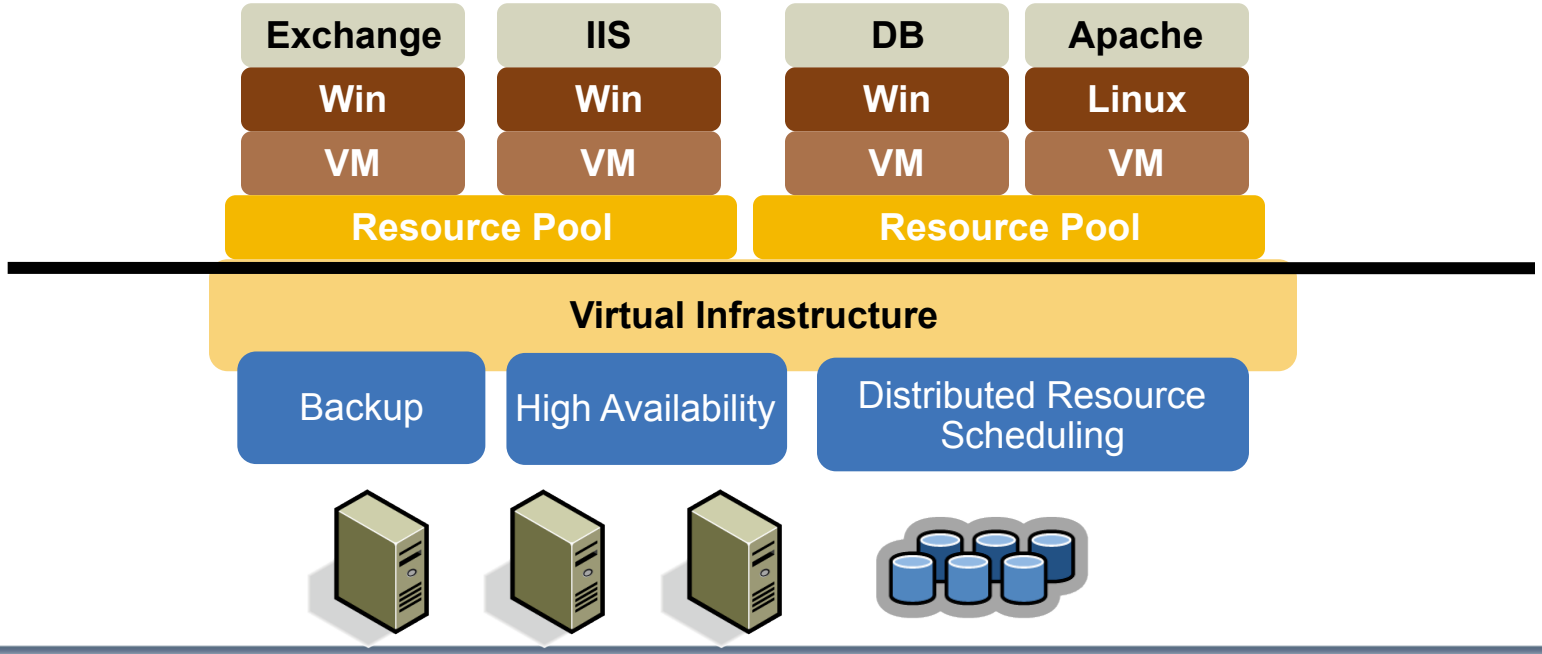
- Entire server – OS, apps, data, devices, and state – is now simply a file
- Enabled by uniform virtual hardware and state encapsulation



- 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



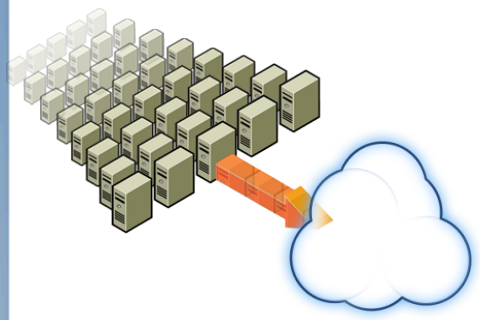
Virtual Machine as a Compute Engine

- **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

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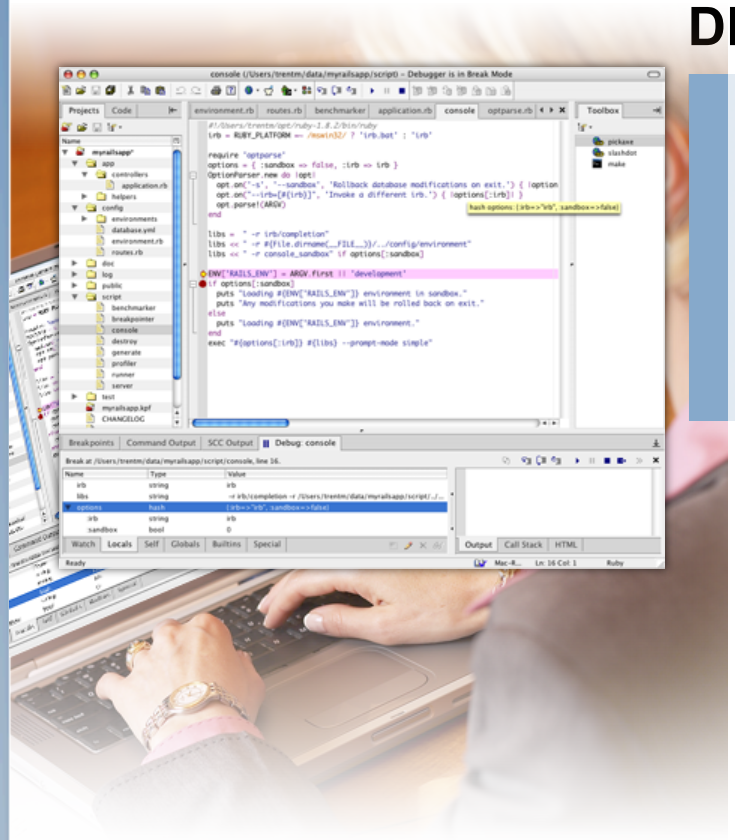
Different Types Of Cloud Computing



DEVELOPMENT

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

rPath™

Engine Yard™

Google app engine

salesforce.com Success On Demand.

cohesiveFT assemble. deploy. manage

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.

terremark Worldwide, Inc.

flexiscale™

amazon web services™

MOSSO the hosting cloud

Two Main Deployment Environments

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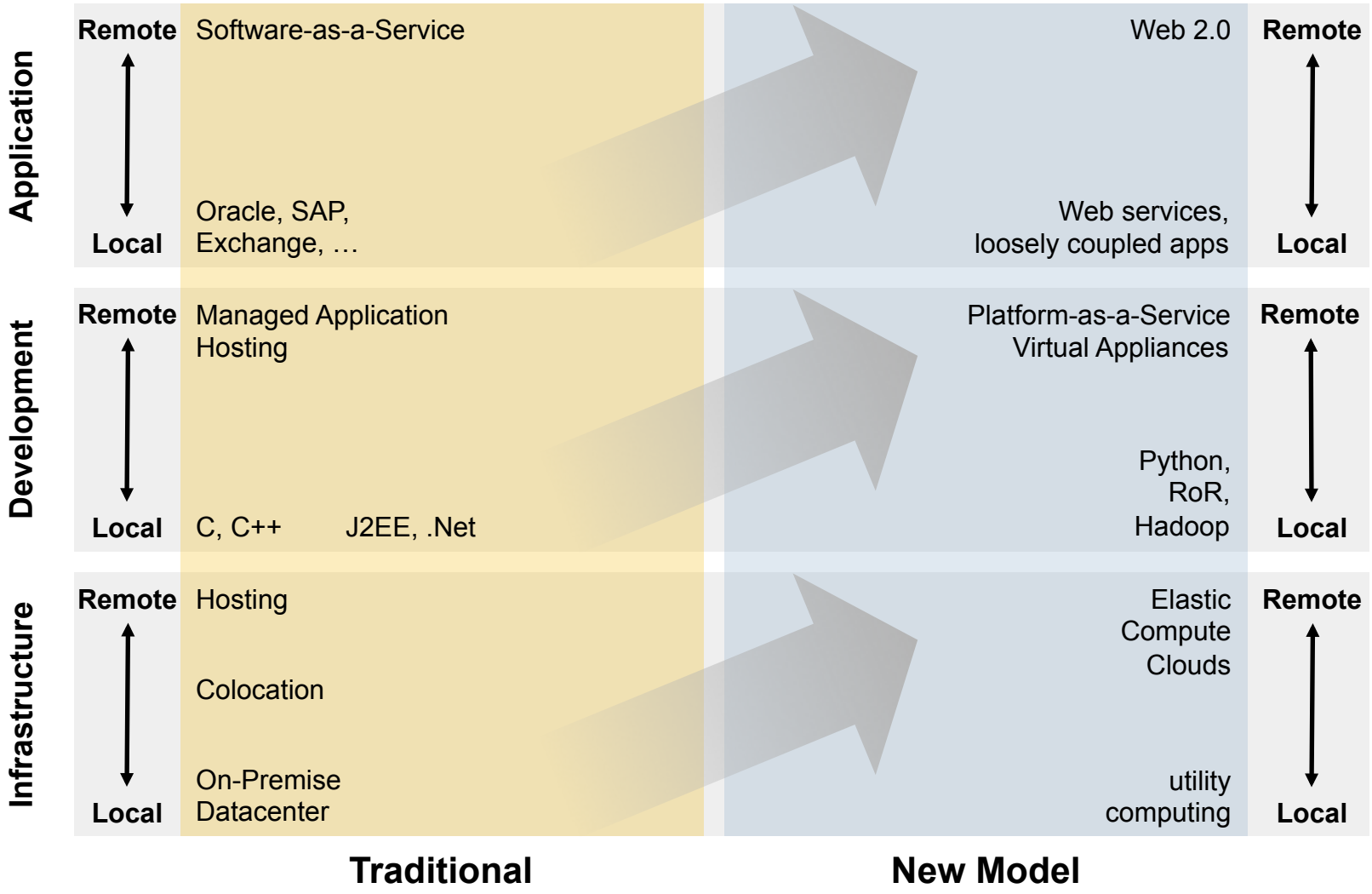
Map Of Cloud Computing



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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 performent
  - Must be highly scalable
  - Need new more course 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

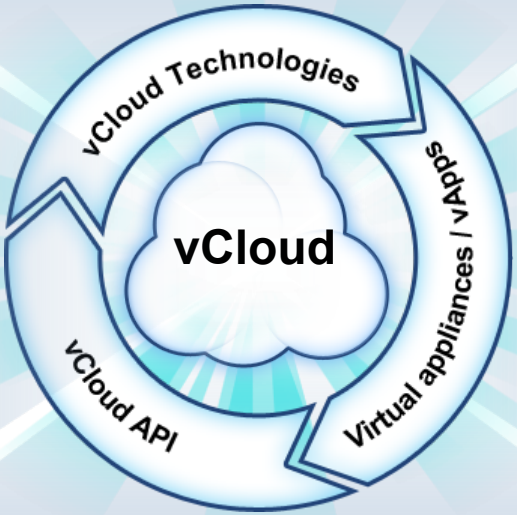
- **Lack of standardization creates complexity and switching costs**
  - Each compute cloud vendor has different application model
  - Proprietary, vertically integrated stacks limiting choice, increasing switching costs

- **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

Enterprises

Service Partner Ecosystem



Broad Application Support

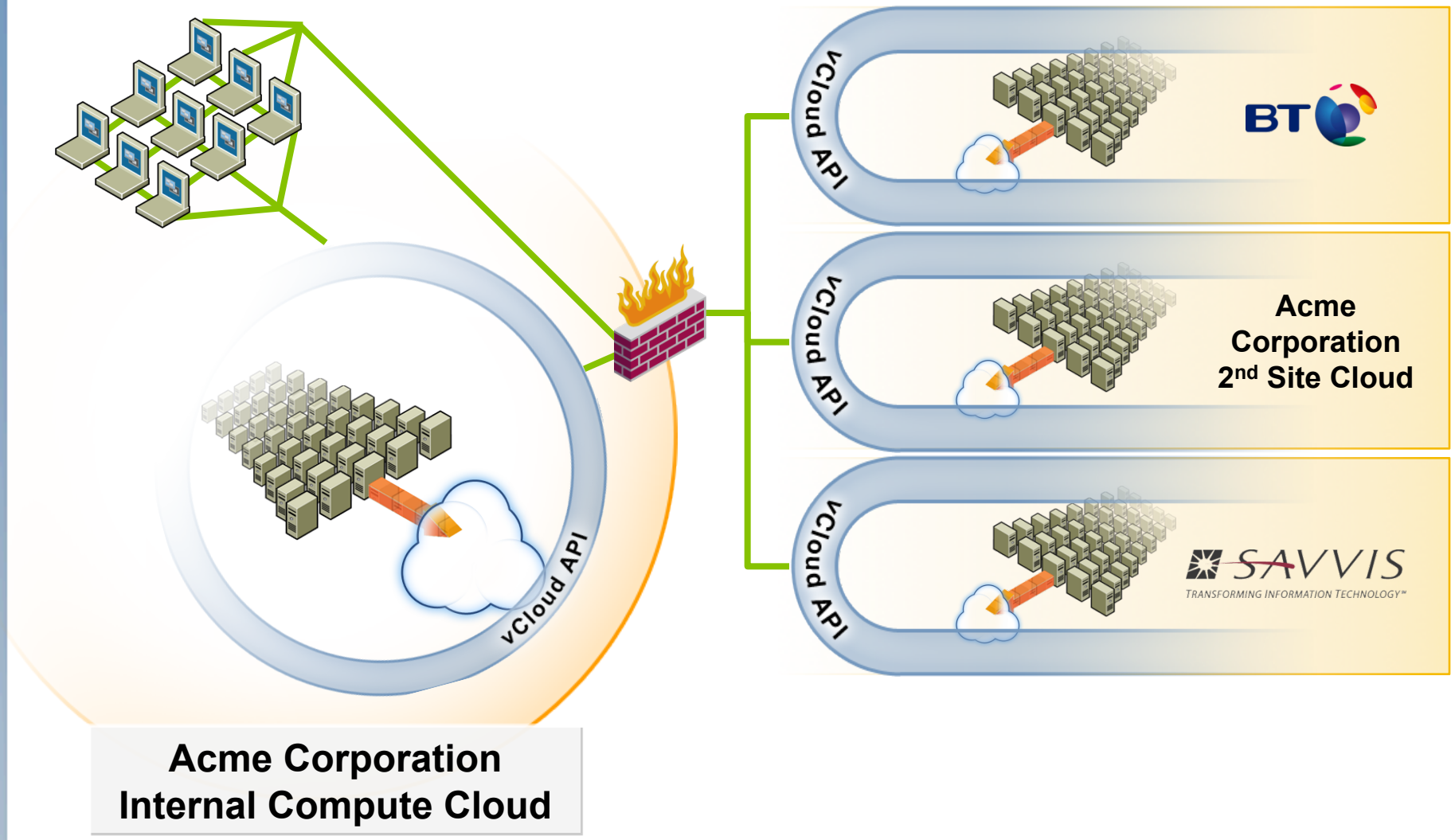
Allocation

Aggregation

Abstraction

Virtual Datacenter OS

VMware vCloud



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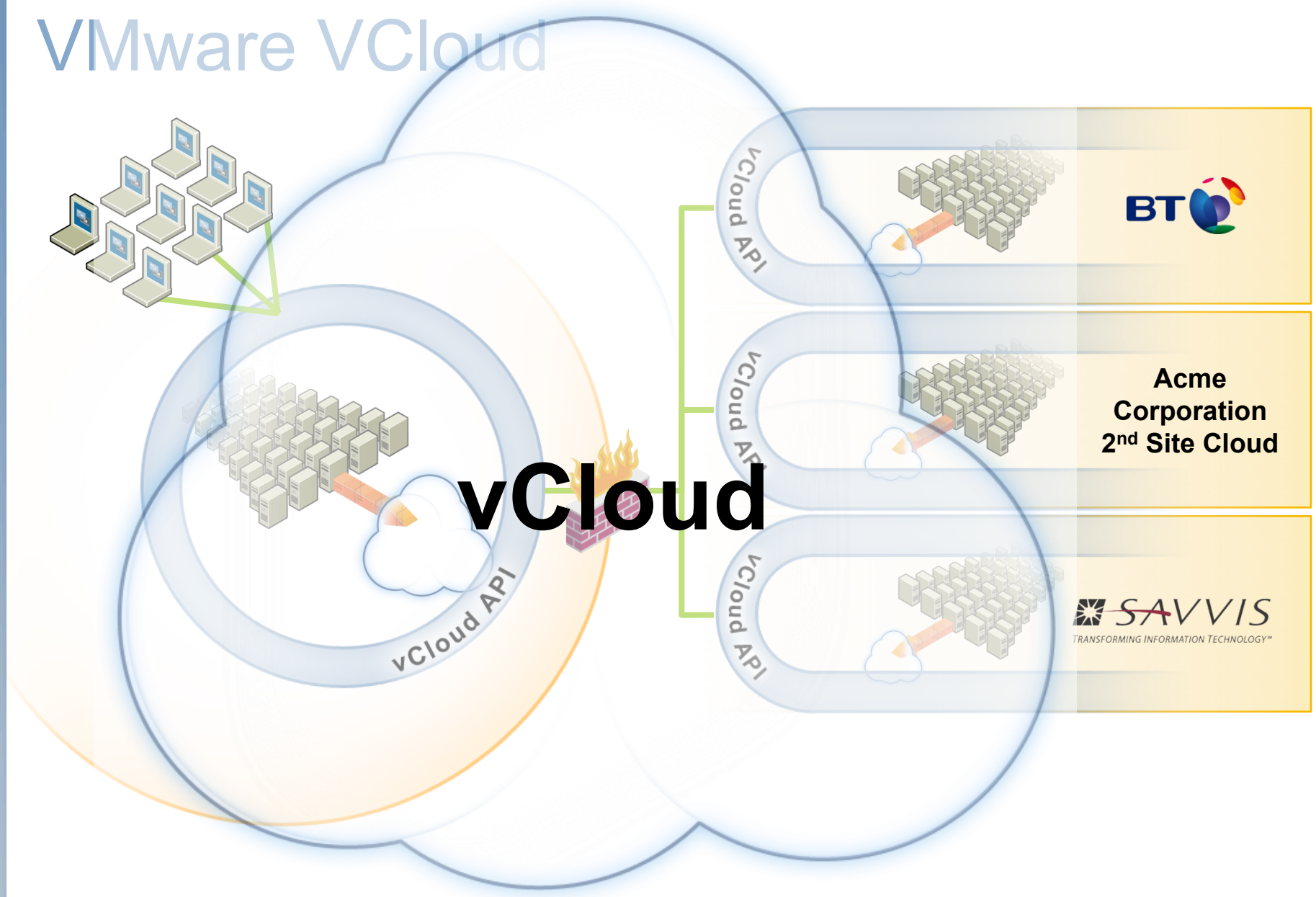
VMware VCloud



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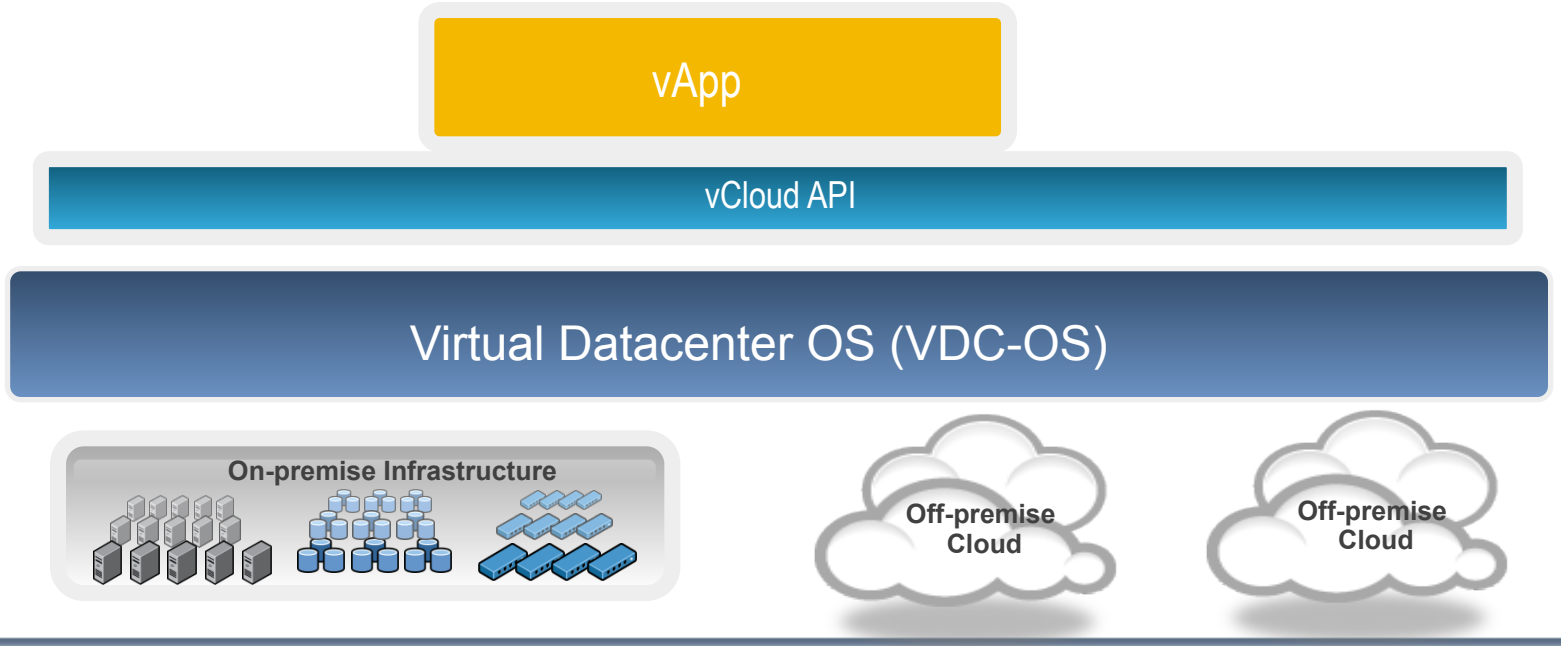
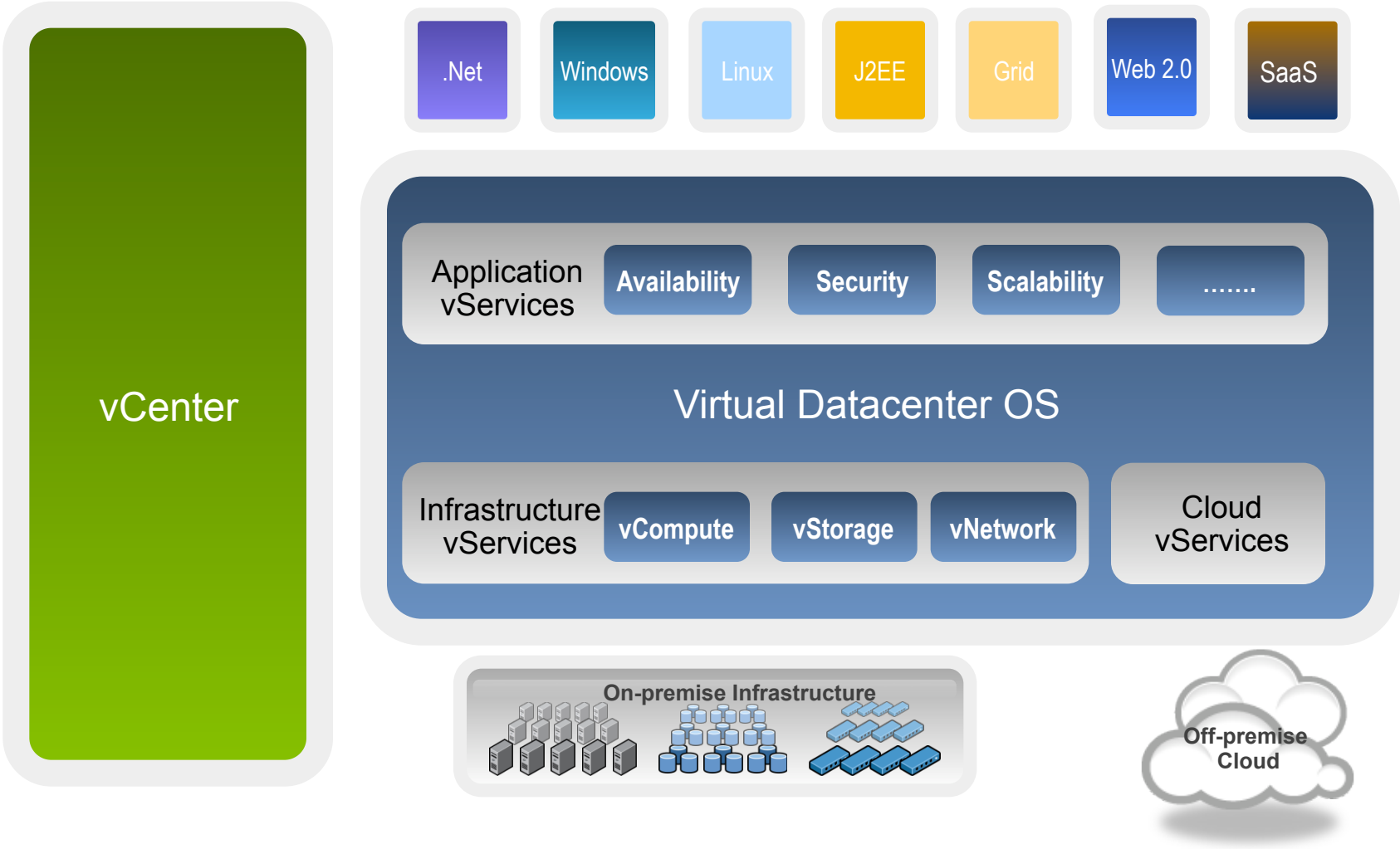
vCloud Components

- **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)



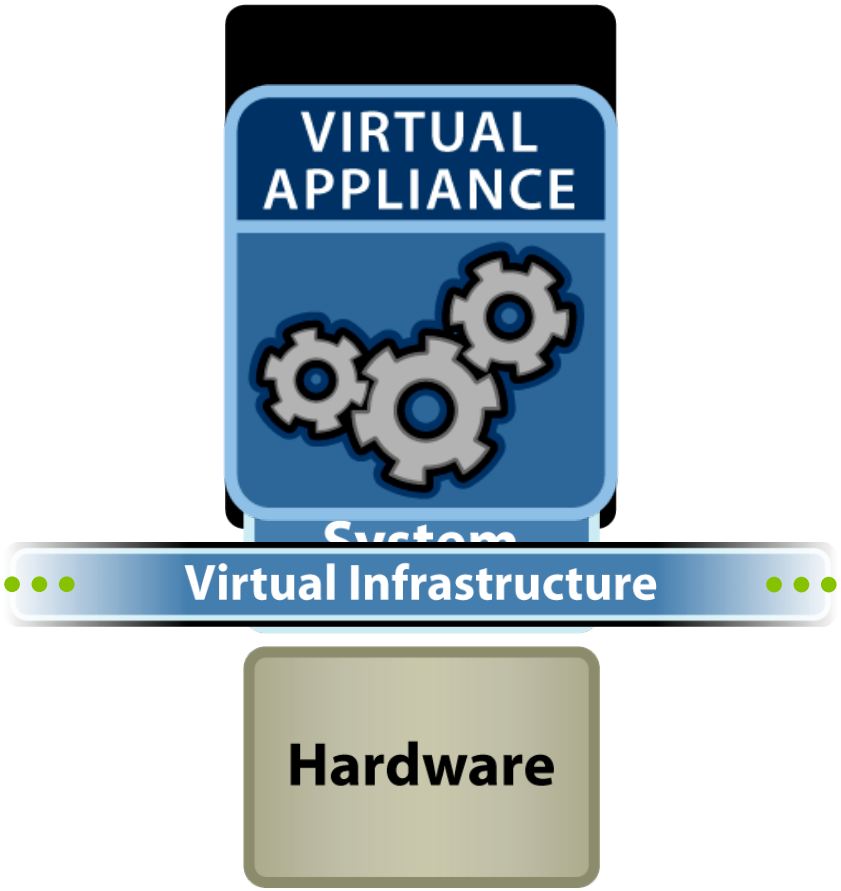
Consequences of a VDC-OS for application developers

- **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

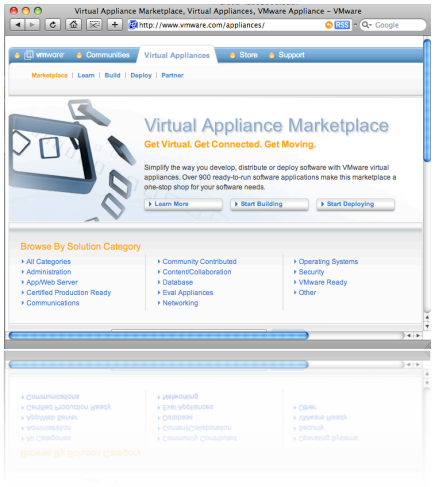
vApps – Applications for VDC-OS

- 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**



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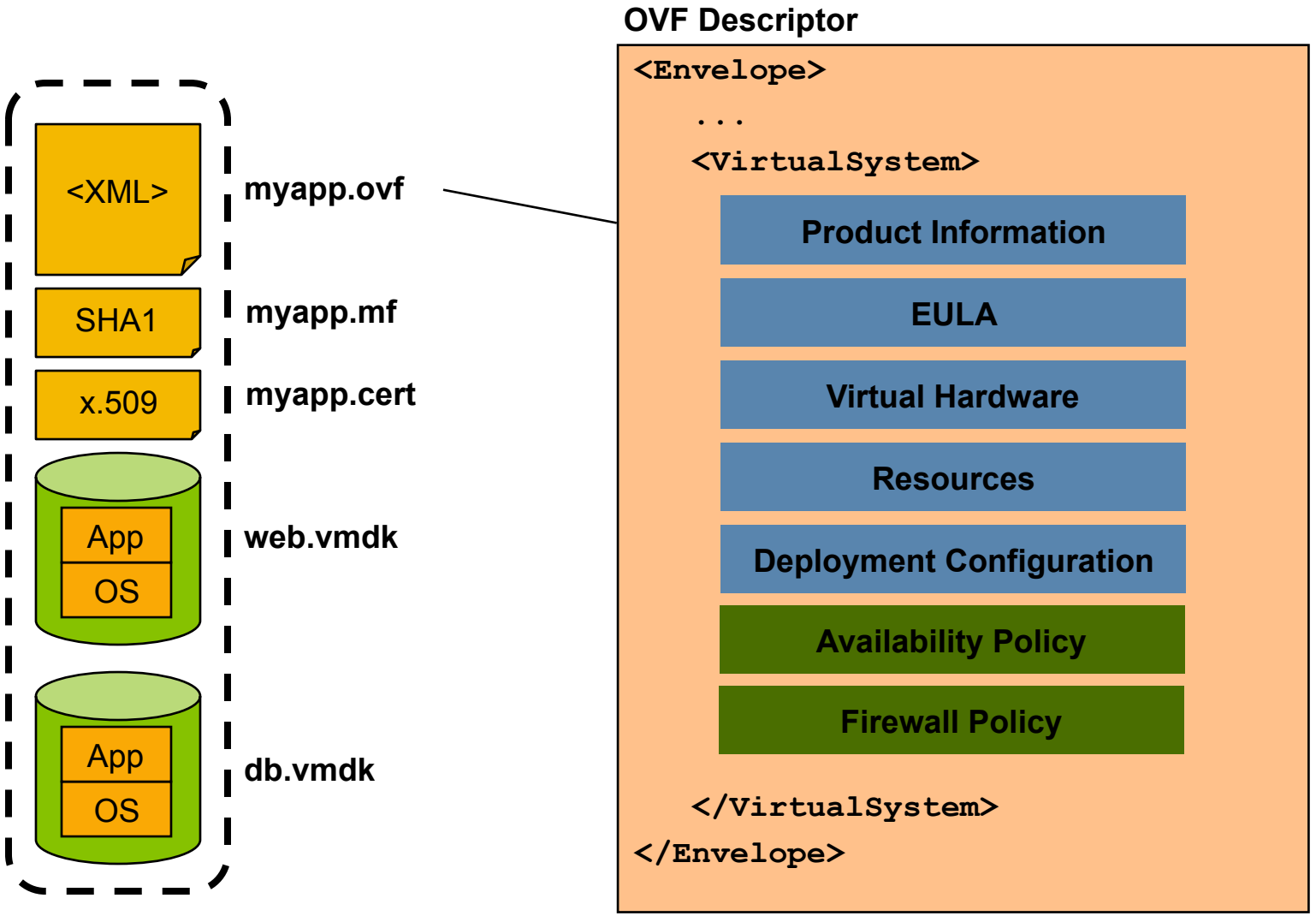
Open Virtualization Format (OVF)

- **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

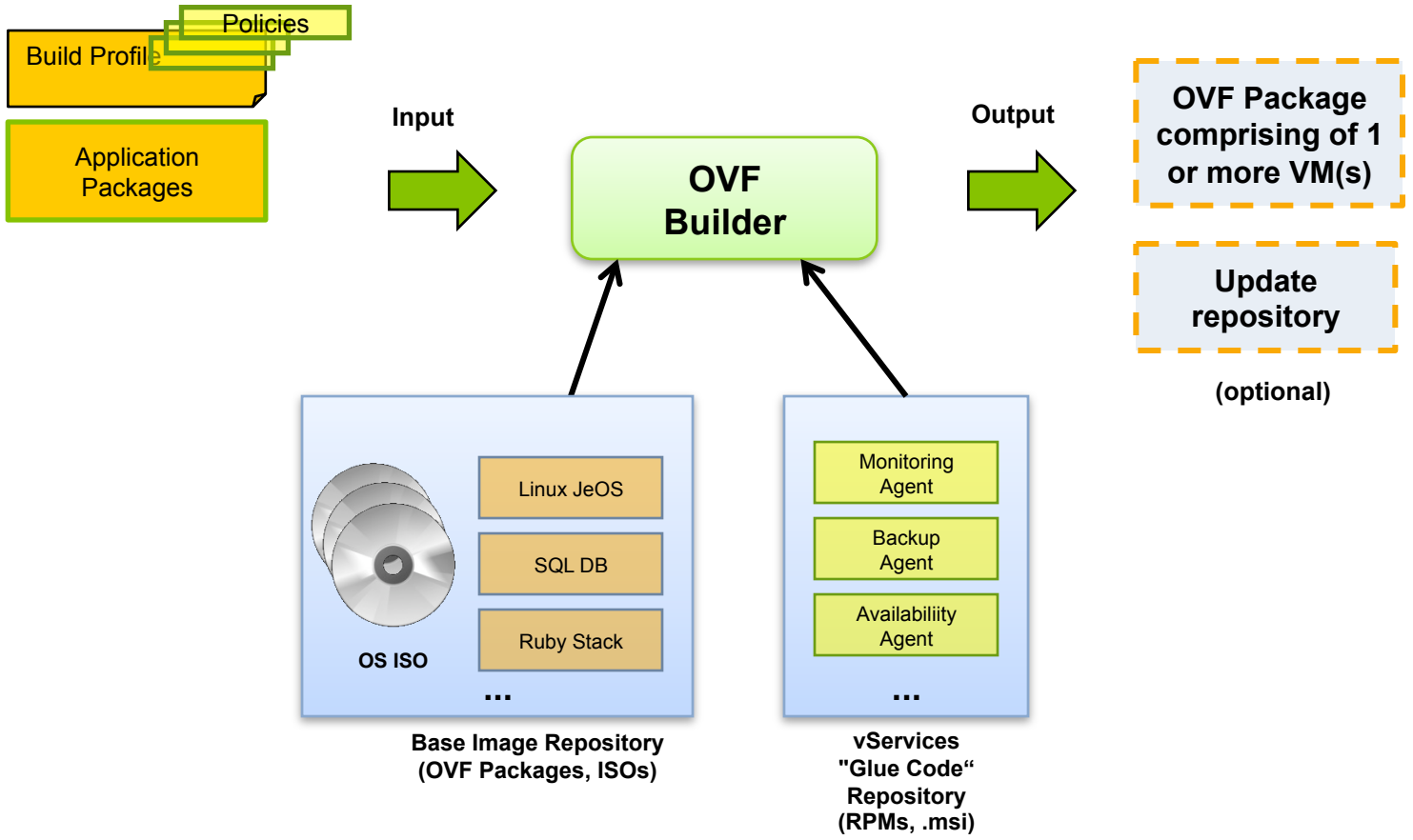
OVF Package



vApp Workflow

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

Building a vApp

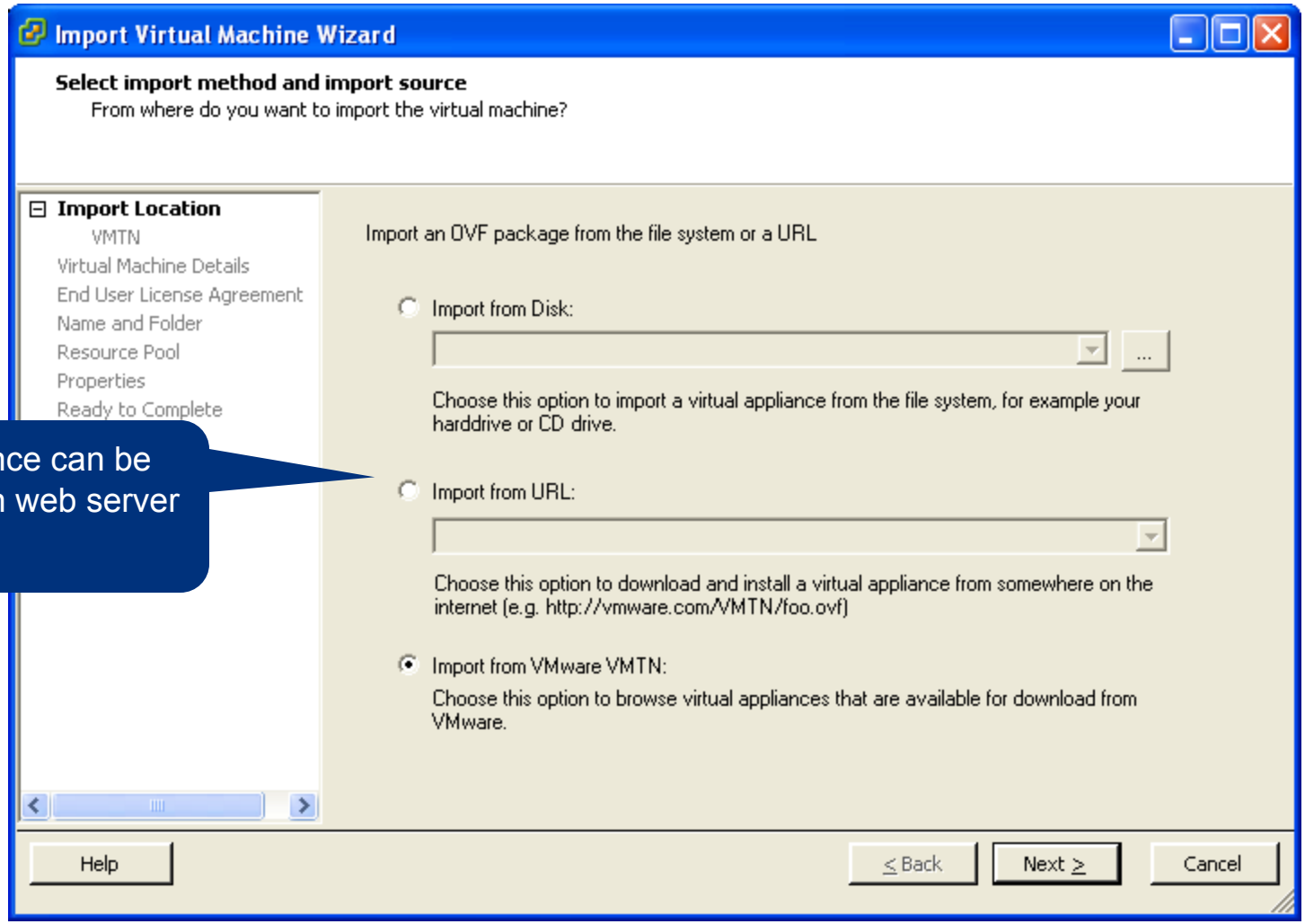


VMware Studio

- **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

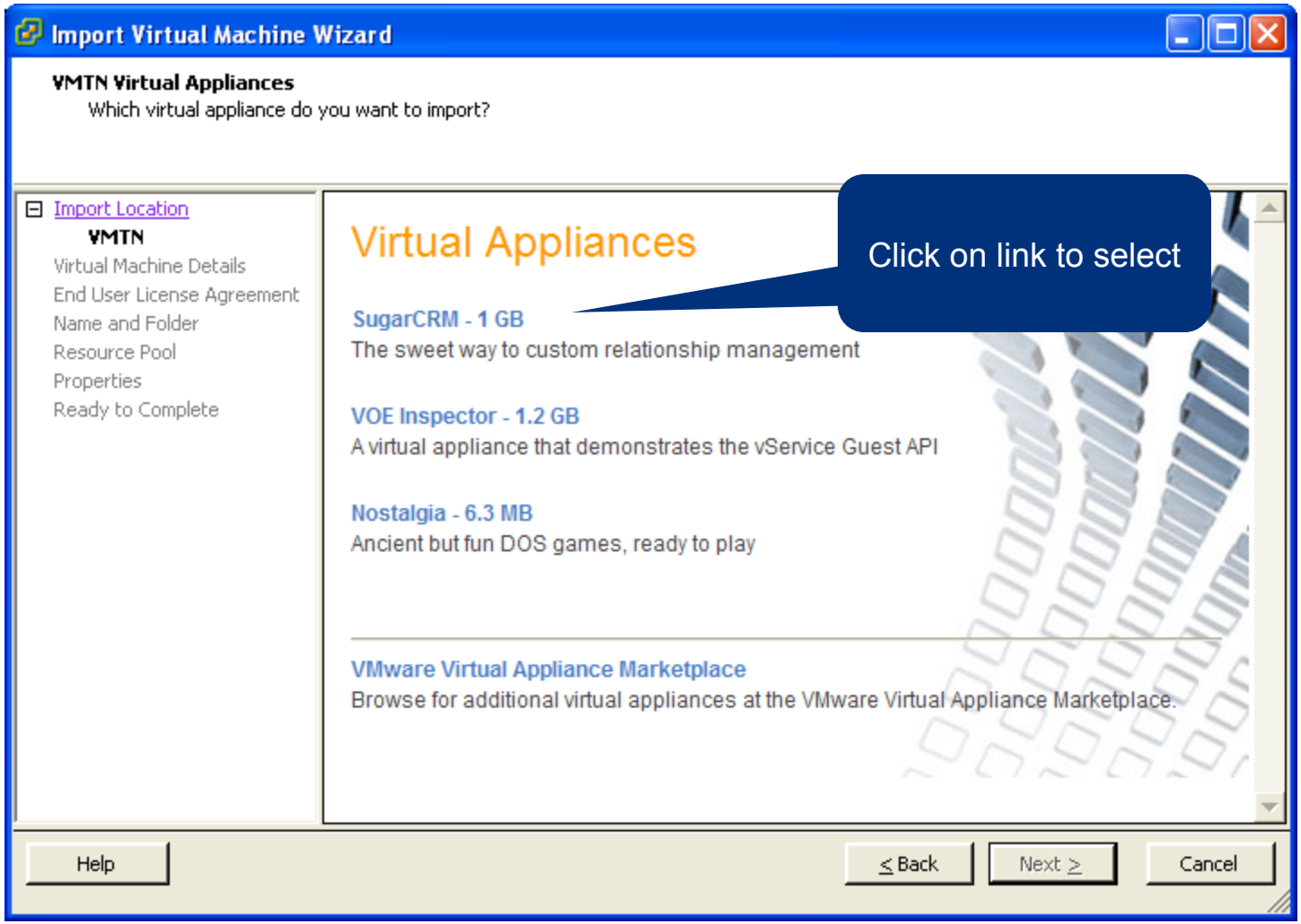
  Enable on-going maintenance
  - Build VMs that are capable of self-maintenance
- **Integrate into automated build systems**

Deploying vApp: Select Source



Appliance can be stored on web server

Deploying vApp: VA Marketplace



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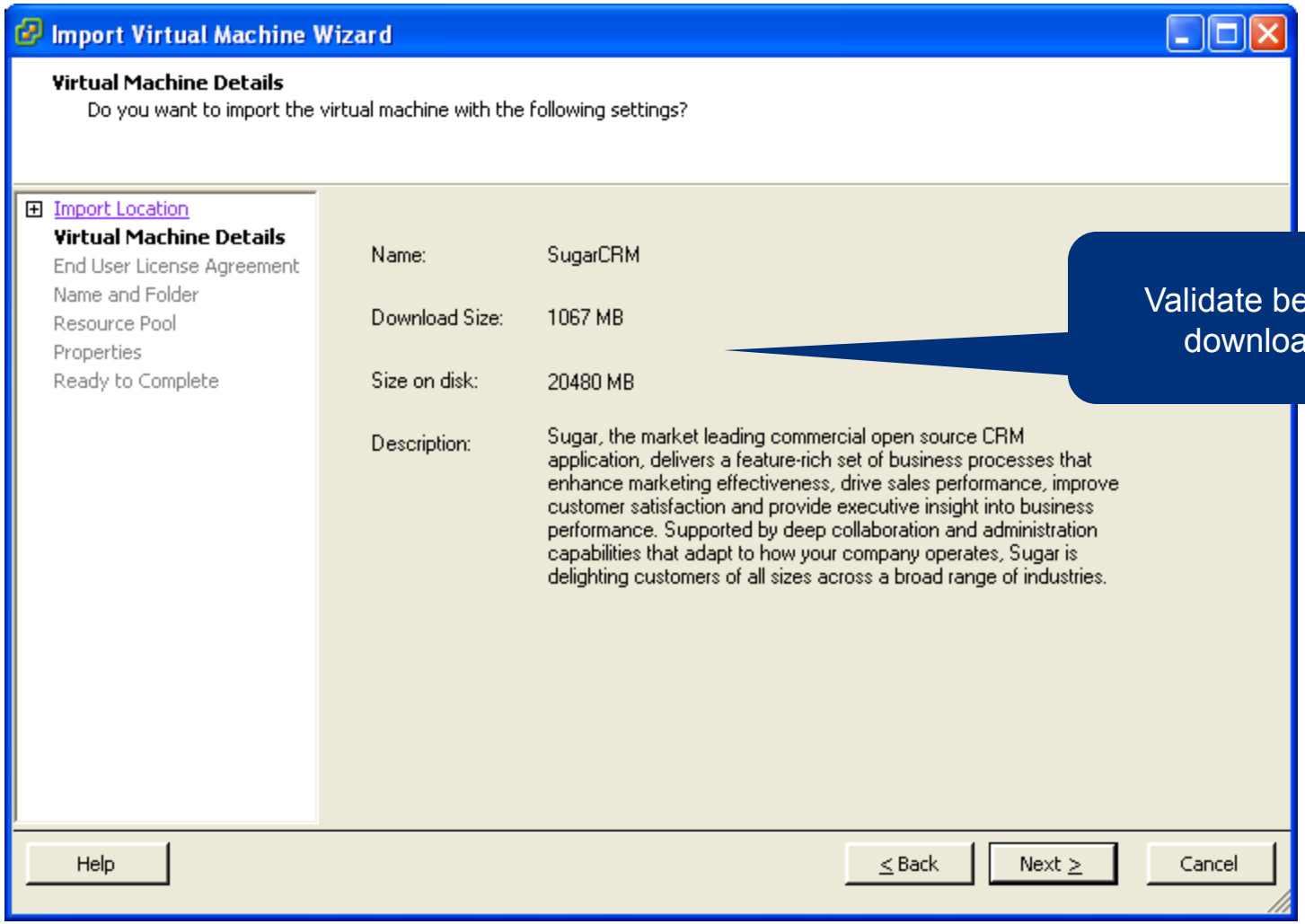
Deploying vApp: Product Information



Validate before download

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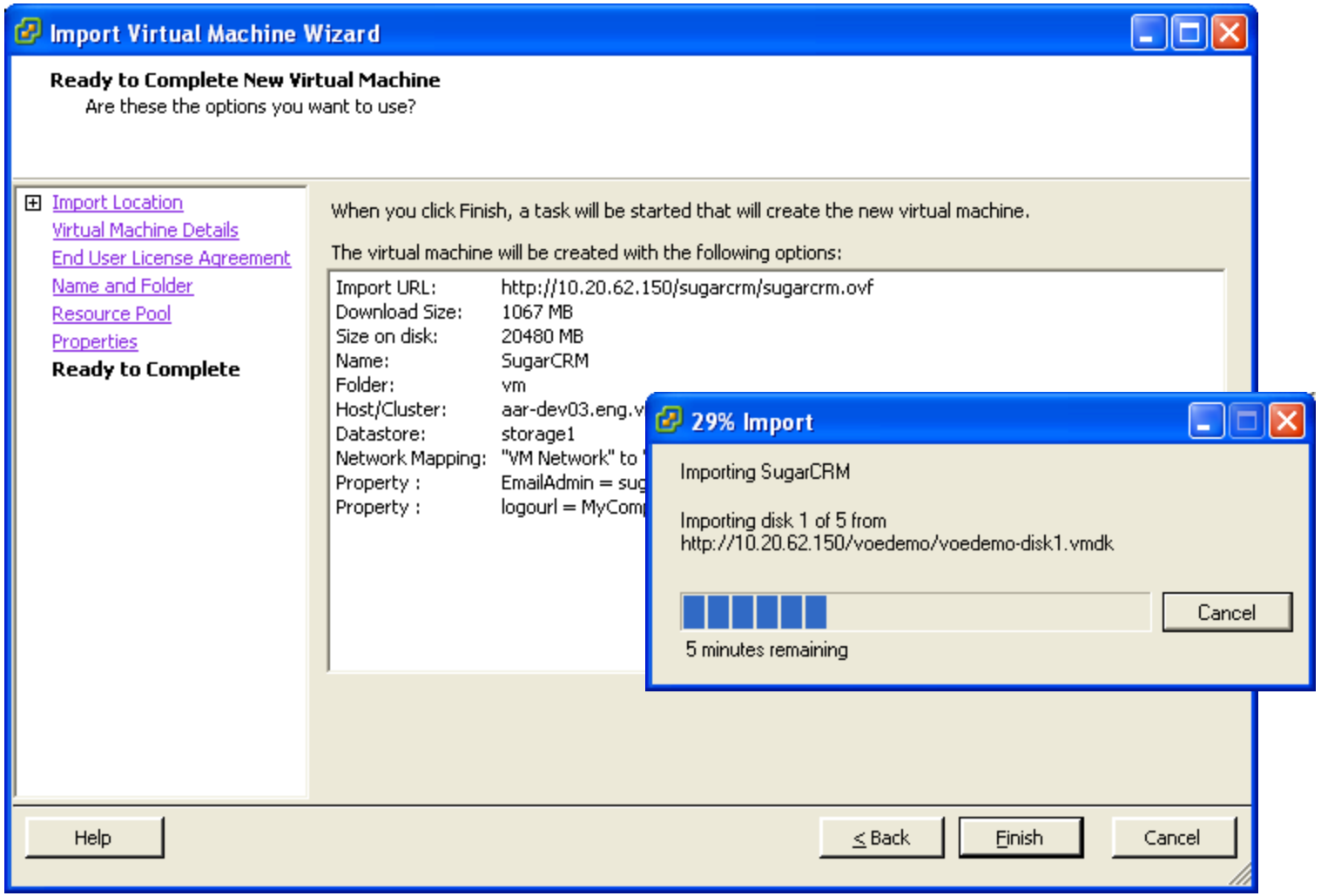
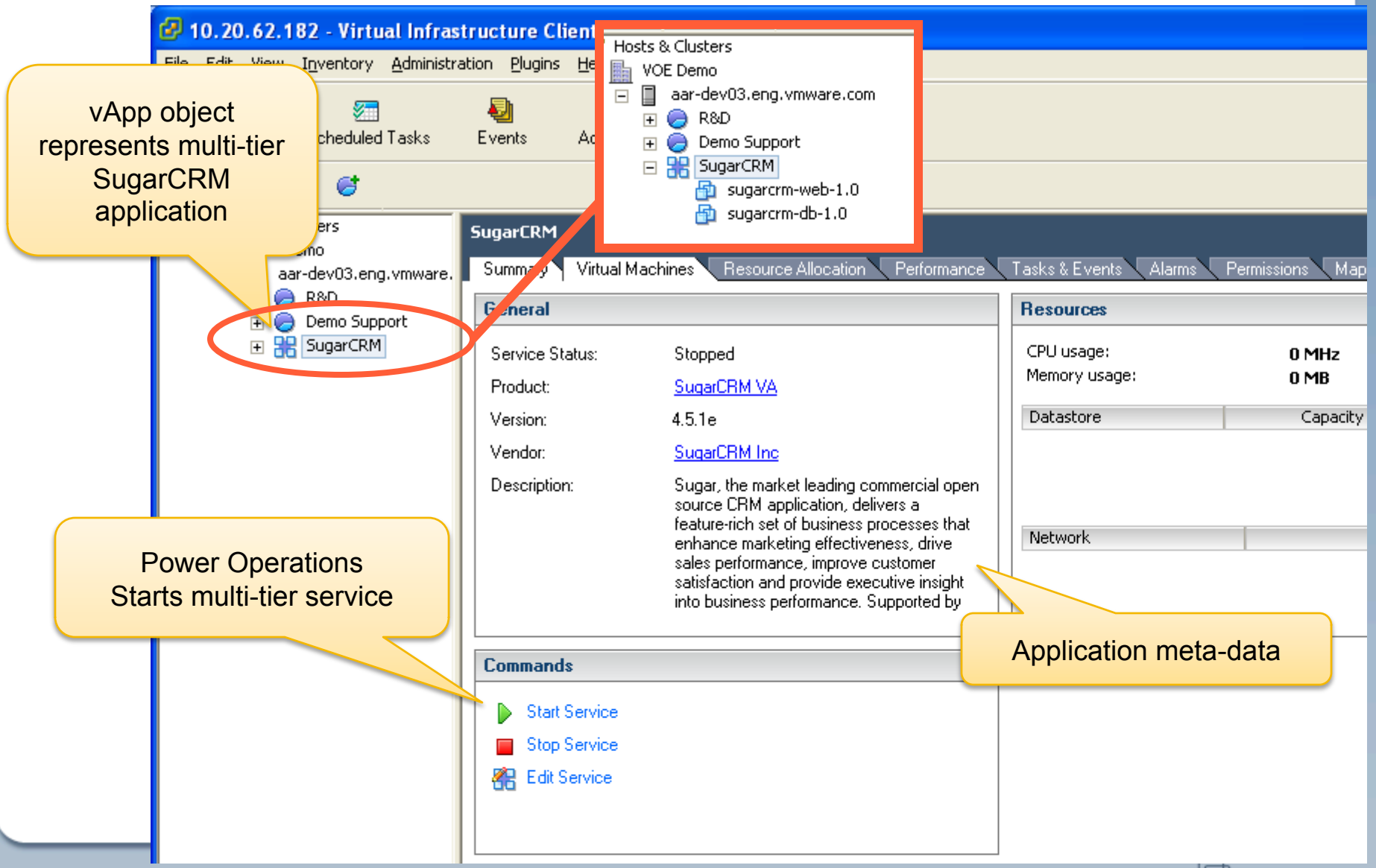
Deploying vApp: Download



vCenter Inventory



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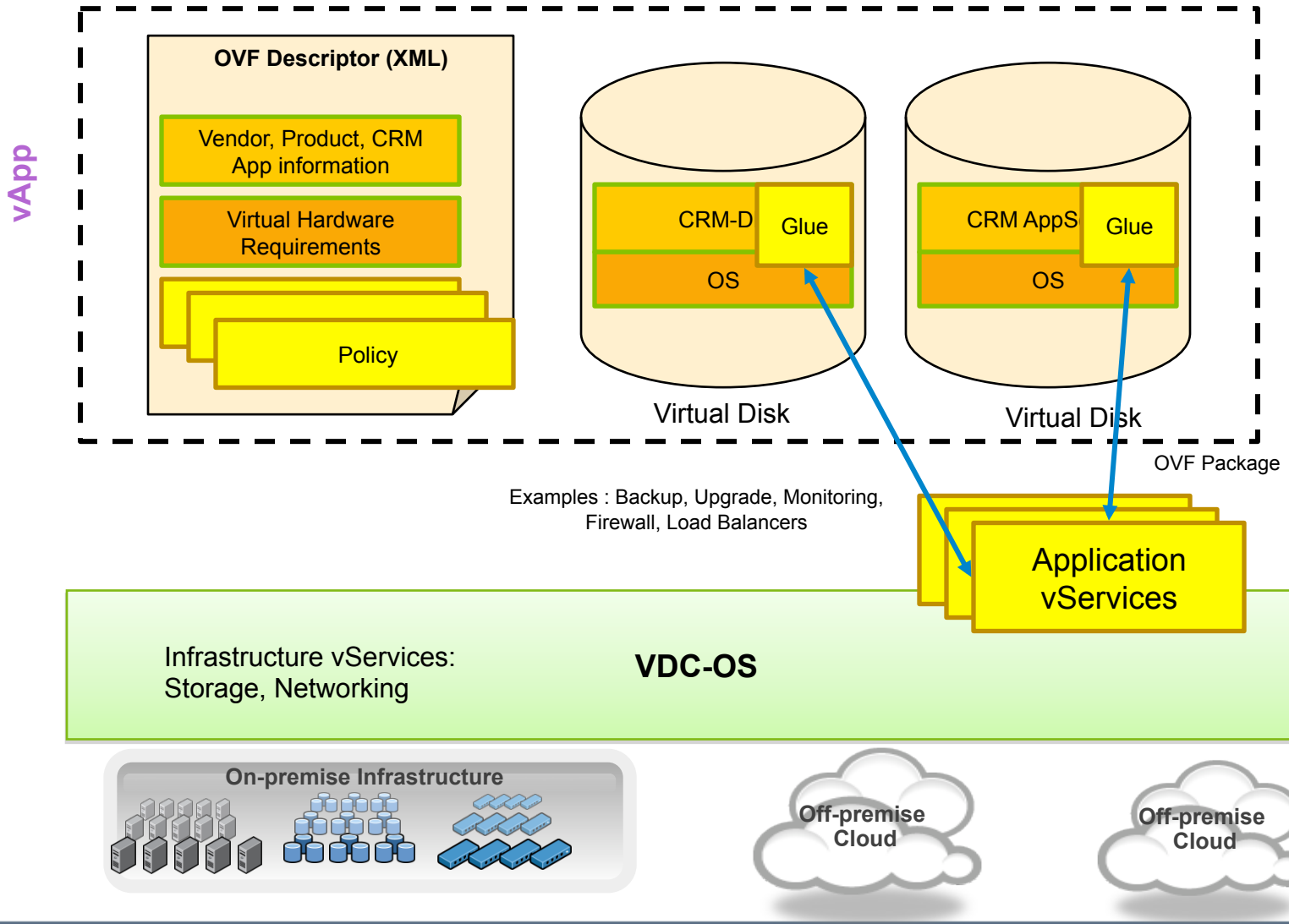
Putting it all together



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**