



Enterprise Virtualization Environment 3.0



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Enterprise Virtualization Environment 3.0

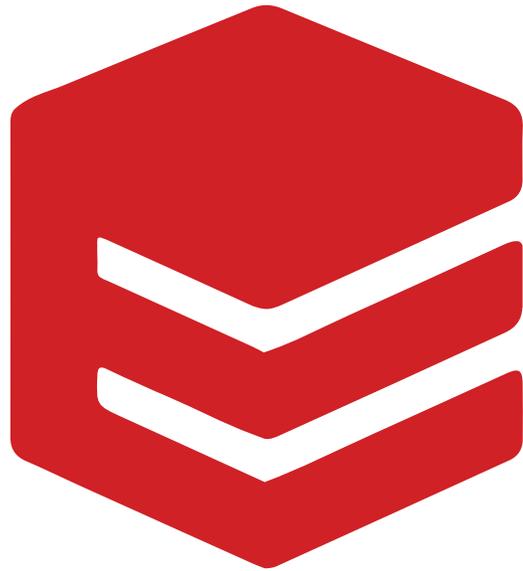
What is E.V.E.?

E.V.E. is a conceptual model of our state-of-the-art virtualization infrastructure. E.V.E. consists of three major layers: The Physical Layer, The Network, Server, and Storage Layer, and The Virtualization Layer.

The three major layers include four sub-layers each for a total of twelve layers. Each layer and sub-layer represents a basic building block of the environment.

E.V.E. 3.0 was designed with several goals in mind:

- 100% Customer Uptime
- Near-Physical Server Performance
- Absolute Data Protection
- Support for High Value Custom Services
- Industry Cost Leadership
- Industry Environmental Leadership
- SSAE 18 Type II Audited



We select best-in-class solutions for each component in the environment, implementing data center, networking and VMware best practice at every level. An independent CPA firm performs SSAE Type II Audits on E.V.E. annually to ensure the highest possible service level. Infinitely Virtual is committed to delivering to our customers the highest quality products and services, which is made possible through our unique Enterprise Virtualization Environment™.



Physical Layer: Building

SSAE 18 Type II Audited Data Center

The data center building is the first layer of our environment. The 40 megawatt, 450,000 square foot data center is SSAE 18 Type II audited. It is equipped with a Dual-interlock, dry-pipe pre-action fire suppression system with VESDA.

Layer Features:

- SSAE 18 Type II Audited
- Fire suppression system

Los Angeles Building Layer:

- SSAE 18 Type II Audited
- 424,000+ square feet.
- Dual-interlock pre-action dry-pipe sprinkler system with VESDA
- Exceeds seismic zone 4 Requirements
- Above 500 year flood plain

Boston Building Layer:

- SSAE 18 Type II Audited
- 53,000+ Sq Feet
- Dual-interlock pre-action dry-pipe sprinkler system with VESDA
- Hardened exterior designed to withstand 125 mph winds

Physical Layer: Physical Security

State-of-the-Art Physical Security

Physical access to E.V.E. is restricted to employees of Infinitely Virtual. The data center itself is staffed by security 24x7. To enter the building, you must first pass through a mantrap, operated by security guards and managed by both keycard and biometric access control. Entry to each floor and suite is controlled by keycard. All public areas of the building are covered by CCTV surveillance, which is monitored 24x7.

Layer Features:

- 24x7 security guards
- Multiple mantraps
- CCTV surveillance
- Biometric access control





Physical Layer: Redundant Power

100% Uptime Power Protection

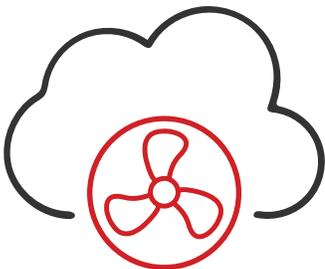
Circuits follow a diverse path to distinct circuit breaker panels. The panels are powered by diverse UPSs. Utility power and generators each connect to Automatic Transfer Switches, which feed the UPSs. This configuration is designed to ensure 100% system uptime by eliminating any single points of failure.

Layer Features:

- N+1 uninterruptible power supplies
- Automatic transfer switches
- Redundant load-balancing circuits to all equipment

UPS & Generator Protection

E.V.E. is redundantly powered and backed up by both Uninterruptible Power Supplies (UPS) and generator power. All loads, including the cooling system, are powered by an “A” and a “B” circuit, each of which is robust enough to supply power for the entire load.



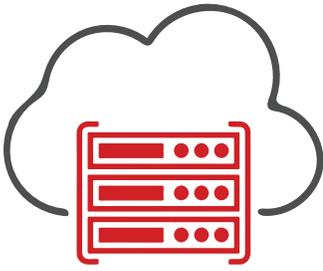
Physical Layer: Redundant Cooling

Efficient Cooling for the Environment

Cooling is as critical to uptime as it is to environmental protection. Servers, storage and other networking equipment may operate in widely varying temperatures, but as the temperature in a data center rises, so falls equipment lifetime and power efficiency. Our data center cooling is controlled to achieve optimum equipment life and power efficiency. All cooling loads are supported by no less than N+1 cooling systems, meaning that E.V.E. continues to operate properly if one or more cooling systems are down.

Layer Features:

- Minimum N+1 cooling systems
- Optimized for both equipment life & power efficiency



Network, Server & Storage Layer: Local Area Network & Internet Connectivity

Intrusion Detection & Prevention, Anti-Virus, and Anti-Spyware

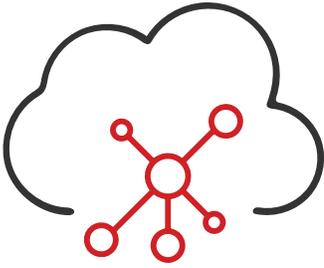
All traffic entering E.V.E. is inspected and filtered by our industry leading Intrusion Detection & Prevention (IDP) screens. Our IDPs are designed to identify and block threats before they enter the environment. We protect all customers from Volumetric DDOS attacks, which have been used by criminals to shut down some of the largest institutions. Some of the threats we protect against are:

- Spyware
- Viruses
- DoS attacks
- Brute force attacks
- Botnet
- Other common vulnerabilities
- Code execution
- Info leak attacks
- Overflow attacks
- SQL Injection
- Phishing
- DDOS protection

Redundant, High-Performance Network

This layer is E.V.E.'s nervous system. It is composed of redundant 40 gbps core switches, multiple bgp routed Internet connections to multiple upstream service providers, and multiple IDP and firewall clusters.

The center of this network is our redundant 40 gbps layer 3 network switches. This configuration provides extreme throughput and low latency connectivity to our entire network, and it is intelligent enough to route



Network, Server & Storage Layer: Wide Area Network

Site-Level Protection

Our Enterprise Virtualization Environment™ spans multiple data centers, and to ensure secure, reliable communication among our sites, we have implemented a fiber-based QinQ Ethernet network between data centers.

Layer Features:

- Multiple data centers
- Multiple 10 gbps QinQ Ethernet Interconnects



Network, Server & Storage Layer: Physical Storage Infrastructure

Business Continuity

In addition, all data is replicated from the primary data center to a secondary data center on an hourly basis, protecting all customer data through any catastrophic failures at the primary data center. In the unlikely event of a site outage, VMs are powered up at the secondary data center.

Industry Leading Fault-Tolerance

Our NetApp filers are clustered, meaning that if one of the controllers fails, the remaining controller will automatically take over the load. This configuration is designed to maintain server availability through any hardware failure.

Industry Leading Disk Performance

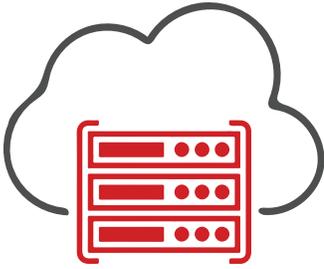
We offer 4 tiers of disk.

Tier 1: All Flash volumes based on NetApp AFF Systems which have industry leading performance, offering sub-ms latency.

Tier 2: Flash Enabled SAS. Volumes are based on NetApp 10K SAS with SSD Flash Pool technology, offering less than 3ms latency.

Tier 3: 10K SAS volumes composed of a minimum of 240 10k SAS drives, with less than 10ms latency.

Tier 4: 7.2K SATA volumes for low cost archival storage.



Network, Server & Storage Layer: Physical Server Infrastructure

Industry Lowest Watts/VM

Our BladeSystem enclosures enable up to 16 physical servers to share power supplies, fans and network interconnects. Servers boot from ultra low-power SSD drives. This configuration enables E.V.E. to operate at some of the lowest watts/virtual server in the industry or approximately 14 watts/VM.

Raw Performance

To satisfy our requirements for density and power efficiency, our physical server layer features HP Proliant bl460c blades in c7000 BladeSystems. Each blade has up to 512 GB ram and up to 32x 2.5 Ghz cores. Physical servers are connected to the backbone by a redundant, low-latency 10 gbps switch fabric. This configuration ensures high performance and network fault-tolerance.

Layer Features:

- HP Proliant bl460c Blades
- c7000 BladeSystems
- Redundant, low-latency 10 gbps switch fabric
- Sub 14 watt/VM power consumption



Virtualization Layer: VMware vSphere

VMware Outperforms Physical Servers

Due to this, we can support a wide array of virtual server operating systems. It has been demonstrated that web servers based on VMware outperform physical servers. And in most applications, vSphere performs comparably to physical servers. With 100% of the Fortune 100, 98% of the Fortune 500 and 96% of the Fortune 1000 using it, vSphere is the most trusted virtualization product in the industry.

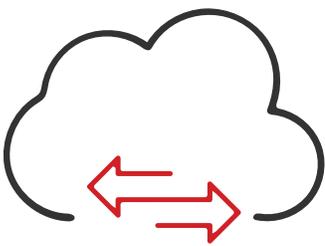
VMware Hypervisor

The VMware vSphere Hypervisor is the heart of E.V.E.'s virtualization layers.

A hypervisor is the software that creates for every virtual machine (VM) the virtual system board and bios, virtual CPUs, virtual RAM, virtual network cards, etc. Accessing hardware through this hypervisor, each VM has its own independent operating system, enabling customers to have complete control over their virtual server.

Layer Features:

- VMware vSphere
- Customers control the operating system
- Support for large number of operating systems
- High-performance hypervisor
- Most trusted virtualization software



Virtualization Layer: Virtual Switch Infrastructure

Public & Private VLANs

Each virtual port belongs to a VLAN or virtual LAN, which fits into one of the following classifications:

- Publicly numbered, not protected by a firewall cluster
- Publicly numbered, protected by a firewall cluster
- Privately numbered, protected by a firewall cluster with NAT

VMs and their associated firewall or layer 3 switch interface in the same VLAN may communicate among one another regardless of what host they are on. Therefore, customers with multiple VMs may have their load distributed among all available hosts on a dvSwitch. And individual VMs may operate from any host in the system.

Distributed Virtual Switches

Virtual Machines are connected to ports on one of our Distributed vSwitches, based on VMware vSphere technology. Each dvSwitch is composed of virtual ports connected to individual VMs and redundant 10 gbps physical uplinks from each VMware host to our redundant 10 gbps switching fabric.

Layer Features:

- Distributed vSwitch
- Support for private VLANs
- VMs may operate from any host, enabling hardware fault-tolerance
- dvSwitch connected to physical fabric with redundant 10 gbps interfaces



Virtualization Layer: Virtual Storage Infrastructure

Our Process:

- Instruct the VSS aware applications on each VM to quiesce all transactions, including:
 - Exchange Server
 - Microsoft SQL Server
 - Windows Server
- Instruct the VM to quiesce all disk transactions, creating a VM level snapshot
- Take snapshot of underlying datastore
- Delete VM level snapshot

This configuration ensures that we can restore your server from any backup with all data intact. This is not true of crash-consistent snapshots. We retain nightly backups for 7 days and weekly backups for 4 weeks. We also take crash-consistent backups every few hours during business hours.

Multiple Datastores & Storage vMotion

E.V.E.'s Virtual Storage Infrastructure is composed of multiple VMware datastores on our NetApp Filers. Using Storage vMotion, a component of VMware vSphere, we can move VMs from one datastore to another "hot" or without shutting down the virtual machine. This gives us the ability to load-balance datastores without disrupting customer uptime.

Nightly Application-Consistent Backups

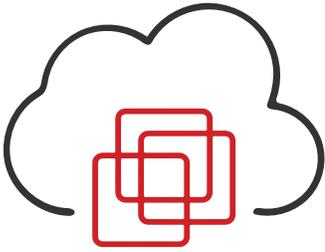
Every VM in our environment is backed up nightly by taking a point-in-time snapshot of the entire datastore. Unlike our competitors who take crash-consistent snapshots of their customers' servers, we take application-consistent snapshots.

Instant Restore & Single File Restore

E.V.E. has the unique ability to restore an entire VM, regardless of size, in minutes. This means that restores that may take hours on our competitors' infrastructures take just minutes on ours. We enable you to choose between restoring an entire virtual machine or a single file.

Layer Features:

- Storage vMotion, enabling zero-downtime load-balancing of the SAN
- Nightly application-consistent backups
- Instant restore of entire VMs
- Single-file restores
- Hourly backups during business hours



Virtualization Layer: DRS, vMotion & VMware HA

vMotion: Hot Migration

The method by which vCenter dynamically load-balances resource utilization among hosts is called vMotion. Sometimes called hot migration, this feature allows vCenter to move a VM from one host to another without disrupting the virtual machine. This enables us to perform maintenance on any host without shutting down customer VMs.

VMware Hardware Availability & Fault-Tolerance

Another role of vCenter is to monitor the health of the hosts and the VMs. If for any reason vCenter detects a host failure, all virtual machines on that host are immediately unregistered from that host, registered on another host in the cluster, and the VMs are then booted up on the new host. This feature gives our customers a very high level of protection from hardware and other failure on a host. Every VM in our environment has this protection included in the cost of their plan.

We offer an option called VMware Fault-Tolerance. This feature creates an active-passive cluster of two VMs. Using a special heartbeat network, vCenter monitors the primary virtual machine, and if it stops responding for any reason, the secondary VM takes over for it.

Virtual Center & Distributed Resource Scheduling

The intelligence behind the virtualization layer of E.V.E. is VMware vCenter Server. vCenter monitors the resource utilization of individual hosts and VMs, and it monitors the aggregate of available resources in all host clusters.

One of the most important features of vCenter is Distributed Resource Scheduling, which allows vCenter to dynamically allocate resources to individual VMs and to load-balance VMs among available hosts to ensure that every server has access to the resources it has been assigned. In our environment, that means that every customer VM has access to its assigned physical resources, and it performs consistently over time.

Layer Features:

- Distributed Resource Scheduling, ensuring consistent VM performance
- vMotion, enabling 0 customer downtime host maintenance
- VMware Hardware Availability on all customer VMs
- Optional VMware Fault-Tolerance