Agenda

- Challenges in Software Development and Test
- Lab Manager Overview and Demo
- The Technical “Heart” of LM: Leveraging Virtualization
  - Linked Clones for instant copies
  - Fencing for simultaneous use of copies
  - Saved State for bug capture and to save time
- Filling out the Solution
  - User Accounts and Quotas
  - Permissions, Sharing, and LiveLinks
  - Resource Management: IP Addresses, Load Balancing
  - Media Library
  - SOAP API
Development and Test Challenges

- **Server Sprawl**
  - 2-3 machines in application development and test for every server in production (+ storage, networking …); Server to Staff Ratios exceed 7:1 in some cases
  - Time and cost to procure more hardware

- **Setup and Provisioning Overhead**
  - Repetitive system setup tasks overwhelming IT and slowing software development cycles
  - Accounts for more than 50% of time expended in the development and test cycle

- **Coordination Problems**
  - Difficult to communicate bugs between test and development teams
  - Teams often cross sites or geographies

- **Costly System Failures**
  - Difficult to reproduce and resolve software defects before production deployment
Introducing Lab Manager

- In some ways like VirtualCenter…
  - Allows its users to create VMs on a pool of servers
- …but in other ways fundamentally different…
  - VirtualCenter targets IT staff creating VMs in production
  - Lab Manager targets developers and testers creating VMs for test and development
  - Lab Manager still allows IT to control developer and tester access
- …driving key functionality differences
  - Lab Manager is about simultaneous deployment of identical copies of configurations that can be copied in seconds (think about a QA and/or developer team wanting to all use the same pre-installed multi-tier system)
VMware Lab Manager 2.4

- New Jersey Dev Facility
  - CIM Application Developer
  - CIM Application Developer
  - Customer Information Management (CIM) Application Development Team
- Waldorf Dev Facility
  - FP&A Application Developer
  - Financial Planning and Analysis (FP&A) Application Development Team
- Bangalore Outsource Partner
  - QA Automation Engineer
  - Application Quality Assurance Outsourcing Partner

VMware Lab Manager
Image Storage Library
VMware Infrastructure
Virtualized Server Pool
Virtual Enterprise Application Development Lab

LAN/SAN
Key Functionality

- Lab Manager provides:
  - Self-service provisioning of groups of machines ("configurations") to entire development, test and QA teams, under IT oversight and control
  - Access to a library of configurations that can be setup in seconds with associated disk resource savings,
  - Configurations can be deployed concurrently with other copies
  - Library configurations can save CPU and memory state saving provisioning time and allowing bug capture
  - Collaboration through sharing machines and copies of machines
  - Increased server utilization due to sharing of a pool of resources and immediate repurposing of the same hardware
  - Works across sites and geographies
Lab Manager Core Technologies

- Linked Clones
  - Copy machines on the order of seconds rather than minutes
  - Lesser storage requirements
- Fencing
  - Allows simultaneous use of copies without changing their properties
- Saved State
  - Never wait for a VM to boot anymore
  - Capture bug state

Lab Manager is a prepackaged application to allow IT to manage and hide the complexity of the files and networking associated with this.
Lab Manager Architecture

- Internet Explorer
  - Console ActiveX
  - Port 80
- Managed Servers
  - Virtualization Engine
    - Fence Driver
    - Fence Driver
    - Fence Driver
    - NIC driver
  - Port 902
- Lab Manager Server
  - SOAP API
  - MSDE
  - IIS with ASP.NET
  - Port 80
  - Port 5212
- Managed Server Agent
  - Port 80
- Storage Servers
  - VM Cache
  - VMs and VMSS
  - SMB/FC
- Lab Network
The following builds show what happens under the covers during the demo. The following actions will be shown:

- Create New Configuration
- Deploy/ Deploy Fenced
- Capture to Library
- Checkout from Library
- Deploy Library Copy in Fenced Mode
- Save Bug State
- Create LiveLink
- Receive LiveLink
Initial Setup with Templates

- Templates are created by importing existing VMs or installing from scratch on top of an “empty” virtual machine.
- Lab Manager uses sparse disks, so that if an 80GB base disk only has 4GB of data on it, it only takes up 4GB of data.
- Here we have 3 base disks, representing templates that we will use to create a new configuration...
Create New Configuration

Lab Manager creates 3 new empty differencing disks on top of the templates' base disks. Differencing disks collect only the deltas between the base disk and what happens in operation of the machine; they start up as essentially zero-length files.

Because differencing disks are so small, the time it takes to “duplicate” a VM is very short and the disk requirements are minimal.

User is returned to the Workspace with a new, undeployed configuration of 3 VMs. Software can now be installed and configured.
Deploy "My First Config"

- The machines are started on the managed servers. As they are started up, Lab Manager load balances them between the managed servers. Console output of the VMs is routed straight from the managed server to the client browser. The rest of the interface comes from the Lab Manager server.
- LM Tools assigns new IP addresses, MAC addresses, and Security IDs to the machines, and reboots them.
- The machines are now ready to be configured, used, etc. They are on the network just like any other machine.
- For illustration, let's undeploy the configuration and deploy it again in Fenced mode…
Fencing

- Property 1: Isolation between fences
  - VMs in fence A cannot directly communicate with VMs in fence B (including NETBIOS broadcasts)

- Property 2: Zero modification of VMs
  - VMs resume from checkpointed state directly
  - We cannot modify anything inside the VMs. Eg. MAC address, IP address, security IDs, or machine name

- Property 3: Internal resources accessible
  - VM inside a fence are able to access other resources on the same internal network

- Property 4: External resources accessible
  - VMs inside a fence are able to access resources on the external network

- Property 5: Internal machine externally accessible
  - An external IP address is assigned to the VM to be accessible from the external network, ie, via RDP
Deploy Fenced

The machines are started on the managed servers. As they are started up, LM load balances them between the managed servers and attaches them to private networks.

The private networks are bound to a fence driver on each managed server that connects them using unicast. A virtual router is created to connect this private network to the lab network.

Fencing allows the same machines to run multiple times simultaneously on same network without changing IP Address, MAC address, or Security IDs.
Memory state is saved to Storage Server via Lab Manager Server

New zero-length differencing disks A', B', and C' are created

Using these new differencing disks and the saved memory state, start up new VMs on the managed servers. This is the new Workspace configuration that can continue to be used

The Library configuration consists of the differencing disks A, B, and C as well as the saved memory states; these will be saved read-only forever unless the Library configuration is deleted

Capture “My First Config” to library, naming it “My First Capture”
Checkout “My First Capture” from Library, naming it “My Library Checkout”

- Differencing Disks A'', B'', and C'' are created off of base disks A, B, and C. Once again, the technique allows for a very quick copy of the VMs.
- Shows up in Workspace as a new undeployed configuration.
Deploy Library Copy in Fenced Mode

Saved Memory States are transferred to the Managed Server

Virtual machines (A'', B'', C'') are started on the Managed Server, along with Virtual Routers. When started they will be in the identical state of the library configuration
Capture “My Library Checkout” to the Library. Name it “Bug Capture”. Send Livelink of “Bug Capture”.

- Suspend machines connected to A”, B”, and C”
- Save memory state along with the differencing disks via Lab Manager Server.
- Update metadata to refer to A”, B”, and C” as a new library configuration. These along with the memory state will be stored read-only unless this library configuration is deleted.
- Create 3 new differencing disks A’”, B’”, and C’” and start up the machines against these disks using the saved memory state. This is the new workspace configuration for the user that created the bug capture.
Receive LiveLink and click Deploy

- Equivalent to “Checkout from Library” with auto-naming and “Deploy Fenced”
- Create new empty differencing disks A''', B''', C'''', and D''''
- Restore memory state associated with A'', B'', C'', and D'', and start up VMs in fenced mode.
- You now have an exact copy of the bug state (“Livelink: Bug Capture”), while the person that sent the LiveLink continues to use the same machines on differencing disks A'', B'', and C''' (“My Library Checkout”)
Filling Out the Solution

- User Accounts and Quotas
- Permissions, Sharing, and LiveLinks
- Resource Management: IP Addresses, Load Balancing
- Media Library
- SOAP API
**User Accounts and Quotas**

- Accounts allow administrator to control usage of storage and managed server resources.
- User accounts can use LDAP authentication or Lab Manager authentication.
- User self service with IT Administrator control.

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<th>Username</th>
<th>Full Name</th>
<th>Role</th>
<th>Deployed VM Quota</th>
<th>Stored VM Quota</th>
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</table>
Permissions, Sharing, and LiveLinks

- Allows for collaboration between members of the development and test team
- LiveLinks allow for easy integration with any system that takes a URL—bug tracking systems, email, etc.
- Configurations can be shared so other users can get to the consoles of those machines, or the configuration can be captured to the library, allowing for everybody to have their own private copy
Save configurations with state to share with others
- Allows bugs to be captured
- Saves time waiting for machines to boot up
- Works with domain controllers and other systems requiring state consistency
- Checkouts create new copies of the machines which can then be deployed fenced
Resource Management: IP Addresses, Load Balancing

- Allows Administrator to control what resources users are using; otherwise it is too easy for users to break things
- IP addresses are checked out for new VMs and used for external fenced addresses; released only after all copies of a VM are deleted
- Load balancing ensures that managed server resources are being used as efficiently as possible
Media Library

- Allows all users access to ISO images and virtual floppy disks stored in a central location.
- Easy to use in Lab Manager virtual machines—makes virtualization more accessible to new users.
- Media can be shared or kept private.
All VM, configuration, and library operations can be automated

Allows quick integration with third-party SQA systems including those from IBM, Mercury, Segue and others

Used for one-click test matrix execution and automated daily build smoke testing

Command line wrapper also available (experimental)
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