

# Palo Alto Medical Foundation



Palo Alto Medical  
Foundation  
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— David Maldonado  
Manager, Server Engineering  
Palo Alto Medical Foundation

## KEY HIGHLIGHTS

### Challenges

- Datacenter on an unsustainable growth path:
  - Out of server space and cooling; nearing UPS capacity
  - Congestion already projected for consolidation/expansion datacenter
- Critical clinical applications require
  - High Availability server clusters that effectively double datacenter size
  - Specialized or obsolete server configurations for legacy applications

### Solution

- VMware vSphere® 4 with
  - VMware vCenter™ management automation
  - VMware High Availability using Distributed Resource Scheduling
- VMware Professional Services Organization assistance with
  - Virtualization Assessment Parts I and II
  - VMware Jumpstart with P2V
  - Architecture Plan and Design with P2V
  - Install and Configure training
  - VMware Fast Track training
- VMware ISV Alliance team support to help key application vendors virtualize

### Results

- \$3+ million ROI in 3 years
- Reversal of datacenter growth
- Improved availability and reliability over clusters, even for critical applications
- Increased capacity and services with no increase in IT staff
- Planned desktop virtualization initiative focused on patient examination rooms

## Palo Alto Medical Foundation

VMware Professional Services and ISV Alliance teams help a health-care technology leader virtualize to control datacenter growth, deliver \$3+ million ROI in just 3 years, and deliver High Availability in Tier 1 clinical applications—without missing a beat.

### Technology and Innovation in Healthcare

The Palo Alto Medical Foundation (PAMF) is a California not-for-profit healthcare organization that pioneered multispecialty group medical practice and new technologies for cardiac care, care for women and children, and patient safety. The organization includes more than 900 physicians and serves more than 600,000 patients throughout the southern San Francisco Bay Area.

For more than 10 years, the Foundation’s IT organization has led the development and support of its electronic medical record (EMR) system, aggregating all patient information into a single, up-to-date, secure record, raising the standard of patient care, and avoiding dangerous miscommunications. The team distinguishes three tiers of clinical applications, based on importance and type of data:

- Tier 1 includes anything essential to the care line: processes such as registration that handle critical patient data; high-priority applications for oncology, radiation, and chemotherapy; and fetal-monitoring systems for perinatal care.
- Tier 2 includes care-line applications that tolerate downtime, such as devices that can queue data when a server is unavailable.
- Tier 3 comprises administrative applications with paper down-procedures that allow delayed data entry.

### Meeting the Challenge of Growth

In mid-2007, PAMF’s two datacenters were totally out of capacity for power, cooling, and server space—every cabinet was full, UPS systems were reaching maximum capacity, and the team needed spot coolers to control temperatures. Projections showed that a consolidation planned for September would only postpone the crisis: more patients, new technologies and higher-resolution medical imaging would quickly force their new, larger datacenter into expansion phase 2, and overwhelm it not long after.

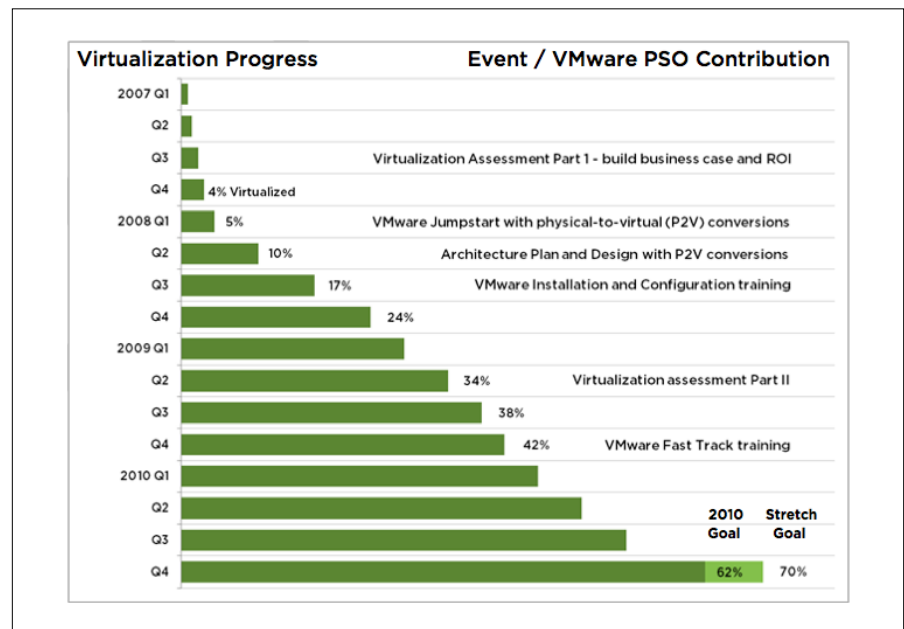
Much of the congestion stemmed from the Foundation’s commitment to electronic medical records, which required that every system be clustered to maintain high availability of critical medical information and processes. Availability came at a high cost: physical clusters running Microsoft® Cluster Server, typically in active/passive configuration with the failover node essentially idle, cut average server utilization to 3-5 percent.

Working with the VMware Professional Services Organization (PSO), Server Engineering Manager David Maldonado and his team assessed the existing infrastructure to identify logical targets for virtualization. After monitoring the environment and gathering performance for a month—including month-end spikes in financial processing and reporting—the team tagged 50 percent of the servers as quick targets, including those running infrastructure applications and several underutilized clinical applications.

The assessment also helped David marshal support from senior management. He recalls, “Three years ago, virtualization was a buzzword, but few people really understood what it was. . . . The best thing to come out of that report was to paint a great picture of the ROI—\$3 million paid back in 3 years—and do it so well that our regional CIO here has really backed virtualization.”

## Teamwork and Transformation

Implementation began with the purchase of 10 HP ProLiant DL380 servers and a VMware vSphere license for each. The team took a conservative approach, limiting processor utilization to 50 percent of capacity so a host failure wouldn’t cause capacity constraints that might interfere with application availability and patient care. Based on their success in the first round of virtualization, the team switched to more compact and energy-efficient HP blade servers, and accelerated their pace until David sometimes felt they were going through the datacenter with a bulldozer. Virtualization progress—and contributions from VMware Professional Services—are illustrated below:



Virtualization Timeline—Palo Alto Medical Foundation

As with any project on this scale, there were obstacles to overcome. But a combination of necessity, persistence, support from PAMF executive management, and services from the VMware Professional and Education Services organizations overcame each one in turn:

- After years of running each application on its own physical cluster, IT applications teams worried that VMware HA Distributed Resource Scheduling (DRS) would cause availability problems and user complaints. Specialized educational materials used in VMware Fast Track training overcame these concerns—and in fact, application availability is now substantially better than it had been on physical clusters.

- The suppliers of the Foundation's dictation and transcription software had concerns about virtual servers' ability to run their processor-intensive application, until VMware's ISV Alliance group helped them validate their product in a laboratory environment. The suppliers have now published a support document for VMware, and the application is scheduled for PAMF's next round of virtualization.
- Resource-limited suppliers of niche medical applications lagged the market in virtualization support, so PAMF adopted a three-step "virtualization first" policy:
  1. Ask the supplier to support just the application in the virtual environment, with PAMF IT supporting the environment and the physical infrastructure.
  2. If "no," offer to provide a virtual test environment for the supplier to validate their application before PAMF moved it into production.
  3. If "no," run the application on a physical server—but ask the supplier to provide a virtualization roadmap.

Vendor objections are less frequent today. As David points out, ". . . three years ago people were saying 'no, it's too new, we don't want to touch it; we don't have time for that.' Now, we'll have a kickoff meeting, I'll bring up virtualization, and vendors will say, 'Yeah, no problem, we support it, we have documents, here's the specs, we're good to go.' Application vendors understand that this has become a standard for datacenters and it's in their best interests if they want to stay competitive to support virtualization."

Today, the Palo Alto Medical Foundation runs about 500 physical and virtual servers with 600TB of NetApp storage, Gigabit Ethernet throughout, and 10GB uplinks. Between 60 and 70 percent of the environment is virtualized, using vSphere 4 running on HP blade servers and vCenter management automation.

### Results as Expected—Plus a Few Surprises

The Palo Alto Medical Foundation's virtualization program has delivered every benefit predicted during the careful planning process:

- Return on investment of \$3+ million over 3 years.
- Datacenter staff headcount stable for more than 2 years, despite substantial growth in capacity managed and services offered.
- Power and cooling costs stopped growing mid-project, then dropped as physical servers were removed.
- Failover and disaster recovery improved from 30 seconds or more with clusters to less than 1 ping with vMotion and DRS—even for fetal monitoring applications.
- Scheduled maintenance time reduced using vMotion to offload virtual machines from hosts that need firmware upgrades or other maintenance.
- "No rush" disaster recovery, using vMotion HA DRS to move workloads automatically in response to a CPU, power supply, or other hardware failure.

Once they had developed a mature, stable virtualization environment and gained some experience using it, David and his team started seeing virtualization opportunities everywhere, for example:

- Testing Microsoft Exchange 2007 and 2010 upgrades in virtual environments, instead of buying expensive hardware

- Maintaining legacy clinical applications in virtual environments on current hardware instead of maintaining a collection of obsolete server configurations
- Using virtual machines for the Foundation's secure DMZ environment, allowing significant expansion of capabilities at low cost

### **Next: Desktop Virtualization**

David Maldonado and his team are evaluating VMware desktop and application virtualization for their next major initiatives: "I think the biggest opportunity is probably our patient exam rooms. . . . in the outpatient environment we probably have between 800 and 1,000 exam rooms that are all fat clients today—almost identical in every respect as far as the applications and what the physicians do with them. Our opportunity is to extend the life of those devices, from 3 or 4 years to 5 or 6 if we can show the ROI."

As for application virtualization, David says, "We have some applications that must have a specific version of Java or version of IE, and it would be ideal to be able to virtualize those, so we don't have to play this juggling game when we try to upgrade a system."

Virtualization at Palo Alto Medical Foundation has been an unqualified success financially, operationally, and in the Foundation's efforts to maintain the very highest levels of patient care.

