SYCHRON

WHITEPAPER

OnDemand Desktop™

Virtualizing Desktops in the Healthcare Environment

The Problem with Healthcare Desktop Delivery

The clinicians and doctors whom you support work hard and are under constant pressure to do their jobs as accurately but as swiftly as possible – there is always another task waiting. Your desktop architecture consists primarily of PCs distributed throughout your facilities, so roaming caregivers can log into the closest available device then start a client to access your medical records backend systems, possibly involving a second login step. If you are like most healthcare providers, the most common request from your caregivers is for you to improve the PC login and records access times that they are forced to endure time after time during their workday as they roam through your facilities tending to patients. How to accomplish this while simultaneously satisfying patient privacy and other regulatory requirements has remained elusive, since PC login times can only be improved to a point.

Virtual Desktops from the Datacenter

Virtualization technology has pervaded healthcare datacenters, enabling IT groups to abstract their many and multirole servers into easily manageable "soft" objects (virtual machines, or VMs) that are fully independent of the underlying physical hardware. VMs may be effortlessly created, duplicated, relocated, and resized as necessary.

More recently, the use of VMs has been extended into the desktop arena in the form of ***virtual desktops*** (VDTs). Today, datacenter servers hosting VDTs are being deployed as a realistic alternative to hosting desktops on distributed personal computers. Existing backend systems for storing and maintaining medical records require no changes as they may be accessed from VDTs in the identical manner as they are from physical PCs.

Today's Solution

One method to eliminate the caregivers' time wasting multiple logins problem is to mobilize the PCs themselves, so they are able to roam with caregivers . This will eliminate the need to log out at one location and back in the next location. This solution has taken the form of rolling medical carts (e.g., Ergotron, ErgoGenesis, Humanscale, etc.) with on-board batteries that enable a PC or laptop to travel around a facility to patient bedsides and only be plugged into an AC outlet as needed for recharging. These carts are fairly expensive, and hauling such bulky devices around is not most caregivers' favorite thing to do.

Tomorrow's Solution

The rapidly emerging solution that is proving successful at solving caregivers' multiple logins problem is the use of ***virtual desktop*** (VDT) ***management systems*** (also frequently referred to as virtual desktop infrastructure, or VDI). Sychron's **OnDemand Desktop** is a system that eliminates the need to transport a cart by running caregivers' desktops on ***virtual machines*** (see sidebar) that execute on centralized servers and allow users to securely access them from remote access devices (fat PCs or thin clients). This method is advantageous, since caregivers can repeatedly ***disconnect*** remotely from their virtual desktops rather than logging out. Their VDTs remain undisturbed in their current states on the server until they need them again from different patients' locations. Then, from any local device and using their login credentials, they quickly ***reconnect*** to it in

seconds – without the need to wait out yet another operating system login and reconnection to backend systems. This is possible since desktop operating systems typically include a built-in communication protocol (such as Microsoft's remote desktop protocol, or RDP) that presents a user a remotely operable window of its desktop GUI (graphical user interface). Keyboard, graphics, and peripheral device-related data is efficiently transmitted between the remote operating system and access device over the network. RDP enables user sessions to be seamlessly disconnected and reconnected, while the OnDemand Desktop VDT management system ensures that only the authorized user of any given virtual desktop is able to reconnect successfully to his or her assigned virtual desktop.

Advantages of Virtual Desktop Management Using OnDemand Desktop

Ease the challenge of managing enterprise-wide desktops and applications.

- PCs are difficult and expensive for healthcare enterprises to maintain, manage, and keep secure.
- Server-based virtual desktops centralize the operation of desktop hardware and administration of desktop images.

Increase productivity.

- Caregivers may roam throughout facilities while remaining logged into their privately accessible virtual desktops.
- Caregivers save precious time and are less stressed by the delays of waiting on PC logins and applications access.
- Performance issues between PC desktops and remote backend systems may be resolved when PC desktops are replaced with VDTs locally connected over a high bandwidth datacenter network to backend records systems.

Reduce costs.

- Centralize PC desktop operations and desktop image management to dramatically decrease desktop administration overhead.
- Extend asset life by using thin clients as virtual desktop access devices instead of fat PCs.
- Reduce overall electrical power consumption and cooling costs.
- All OnDemand Desktop VDTs use a ***gold image*** reference disk and a ***differencing disk*** technique that slashes runtime disk requirements and capital startup costs.

Increase security; improve operational agility.

- Centralize user desktop data storage to the datacenter, and extend existing data management processes and tools.
- Comply with HIPAA and other regulations.
- OnDemand Desktop system architecture enables fault-tolerant system design to flexibly support business continuity and disaster recovery planning and execution.
- Customize event-triggered desktop policies in support of organizational needs such as printer remapping or other situation-dependent functionality.
- Easily integrate with third party middleware and tools.

Breakthrough Simplicity: Sychron Clusters & Habitats™

{ Provision. Manage. Secure. Scale. }

The servers on which OnDemand Desktop is deployed are grouped into ***clusters*** using OnDemand Desktop's graphical user interface (Command Center). A cluster is a set of 1 – N servers (N ≤ ≈ 20) devoted as computer resources to hosting OnDemand Desktop VDTs. Each cluster is controlled from a ***Sychron Management Server*** that may be a physical server or a virtual machine-based server. In either case, failover to a stand-by management server can be automated or simply handled as a manual switchover in the event of a management server outage. When a standby management server is started after any outage, it automatically performs the ***re-parenting*** of its cluster to quickly reestablish the normal operation of the cluster. To scale to the requirements of larger organizations, multiple clusters may be created, all accessible for administration from a single Command Center.

Sychron has pioneered a revolutionary approach called ***Habitats,*** designed to automate the operation and simplify the scaling of a virtual desktop architecture. Simply put, Habitats enable nearly hands-free day-to-day operation of a virtual desktop management system. Habitats are simple to create and manage with OnDemand Desktop's graphical user interface (Command Center) and its system-wide administrative scope. Each cluster may have one or more Habitats created and automatically operated on it. OnDemand Desktop constantly monitors Habitats' status and initiates actions to maintain the overall system in accordance with the individual settings of each Habitat. Habitats automatically provision VDTs of the kind (specified in each Habitat's gold image) and in the quantities (via ***watermarks***) set for them by administrators. Watermarks include both absolute upper and lower bounds as well as load-relative settings that control how many VDTs are powered on and available for immediate login at any given time. As users log in and/or log out, each Habitat will power on or power off VDTs to adhere to its watermark settings.

Habitats handle all virtual desktops as disposable (non-persistent) objects while always preserving caregivers' personal settings and providing them their private disk storage (i.e., *My Documents*). This method improves reliability and security by enabling each Habitat to discard any unused VDT with impunity. A Habitat's ***type of reuse*** parameter may be set so its VDTs are fully reprovisioned each time a user logout occurs – any user just logging in will therefore always be guaranteed to get a freshly created, pristine, new VDT.

Habitats' automated VDT provisioning and reprovisioning behavior is ***goal-oriented*** – any required provisioning or re-provisioning will be made in cycles (to reach the watermark goals) so as to never over-burden server resources or negatively affect end user VDT performance. Modifying a Habitat's gold image parameter to indicate the location of a new, recently updated gold image will invoke goal-oriented reprovisioning in order to bring and VDTs to the latest revision. During reprovisioning, the Habitat will continuously enforce the availability watermarks and will wait until any logged in caregivers log out before reprovisioning the VDTs they are using.

All VDTs managed by OnDemand Desktop are created from a read-only gold image reference using runtime ***differencing disks*** (a.k.a., linked clones). As previously mentioned, OnDemand Desktop VDTs are typically discarded and re-provisioned upon user logout. This approach saves a vast amount of disk space, since a differencing runtime disk is on the order of 100+ megabytes, whereas a persistent cloned VM disk is on the order of 10+ gigabytes.

Each Habitat includes settings that automatically protect their users' service level agreement (SLA) that are controlled by setting the minimum allowable amount of both CPU performance and memory capacity. During operation, Habitats will only power on additional virtual desktops on a given server to the point at which the sum of the SLA settings is equal to or less than the physical resources of the server. In addition to the gold image, watermark, and SLA settings, Habitats include a number of other handy settings that govern Habitat-to-Habitat business priorities, VDT session idle time limit, MAC address ranging for the virtual NICs of VDTs, and primary and secondary virtual network settings, among several others.

Virtual Desktop Access – The OnDemand Desktop Portal

OnDemand Desktop makes access to a VDT as simple as navigating a browser to a Sychron Portal and logging in with user credentials once (i.e., single sign-on). Existing VPN infrastructure may be used for secure remote access, or a proxy login server may be employed for secure connectivity. Microsoft's recent release of Windows Server 2008 TS Gateway™ now provides a low-cost SSL-secured remote access method for administrators to easily deploy the OnDemand Desktop Portal for fully secure external access by traveling, home-based, remote office, or disaster recovery personnel.

Connectivity to virtual desktops is via standard RDP (remote desktop protocol). Access devices may use an Internet Explorer™ browser or Sychron's Java-based client utility for login handshaking with the Portal. A wide variety of thin clients are also supported. The Portal integrates with a local network directory service (e.g., Active Directory™ with no schema changes needed) to support user login authentication and authorization. Authenticated users are then automatically assigned to an authorized virtual desktop, and their RDP session window appears on their access devices.

Example Healthcare Cost Savings

During any system implementation, login times should be evaluated and potential optimizations made through careful refinement of the VDT server and network infrastructure in tandem with any possible fine-tuning of the virtual desktops themselves and/or the Microsoft domain(s) in which they are operated. In real-world implementations, initial login times have been successfully tuned to fewer than thirty seconds. Similarly, RDP reconnects may be tuned, infrastructure allowing, to fewer than five seconds. Assume that caregivers currently spend one minute at each patient stop logging into a local PC, opening the appropriate application(s), and navigating to the appropriate patient's records. Averaging across all clinicians working for the organization, assume that the number of logins per day per clinician was determined to be 30, representing a total wait time of 30 minutes per day. After implementing OnDemand Desktop, assume login at the first station of the day and the opening of applications takes no more than the preexisting one minute. Further, assume that reconnect access to virtual desktops (still connected backend systems) at each patient stop thereafter is a five-second task.

The total time savings therefore equals:

The preexisting 30 minutes – 1 minute for initial login – (5 seconds x 30 reconnects) ≈ 26.5 minutes of time savings per day per caregiver, or just under half an hour per day.

Reducing these calculated savings to more conservatively estimate the time savings to be 20 minutes per caregiver, and assuming an organization of 500 caregivers (daily, over three shifts), the system will save caregivers 10,000 minutes, or about 167 work hours, every single day. Assuming 246 workdays per year per person (365 days minus 52 weekends and 2 weeks of vacation), this represents a total gain of 41,082 hours per year, or 5,135 workdays. Using figures easily researched on the Internet, the average nurse grosses approximately $244/workday, and the average doctor grosses about $1,000/workday. Assuming a ratio of four nurses to each doctor, 80% of the saved days are nurses' workdays, and 20% of them are doctors' workdays. Considering that the time savings appear throughout the workday in one-minute increments, it is reasonable to assume that practically all of the time is devoted to productive activities by moving to the next patient task. For purposes of quantifying the savings in dollars, equate the time savings to the caregivers' incomes as cited (a conservative approach, since in theory healthcare organizations actually generate revenue in excess of they pay to the caregivers they employ). The total dollar savings therefore equals:

(80% x 5135 workdays x $244/workday)	+	(20% x 5135 workdays x $1000/workday)	=	Annual Savings Amount
$1,002,352	+	$1,027,000	+	$2,029,352 per year

Assume that no more than half the caregivers, or 250 users, are ever logged into a virtual desktop at one time (since the 500 caregivers cover 24 hours a day). An OnDemand Desktop system for 250 concurrent users can be (conservatively) purchased outright for $250,000, including all software and hardware (and potentially significantly less). Using this figure, and applying the standard formula for simple return on investment (ROI), such a system's ROI equals:

$$\frac{\text{Gains} - \text{Costs}}{\text{Costs}} = \text{ROI (as a percentage)}$$

$$\frac{\$2{,}029{,}352 - \$250{,}000}{\$250{,}000} = 712\%\ \text{ROI}$$

Note that this calculation does not include any of the likely desktop administration cost savings discussed in preceding sections.

SUMMARY

Roaming caregivers in hospitals interface with their patients on a one-to-one basis and frequently update each patient's records through a local PC or thin client. The benefit of being able to seamlessly disconnect from and reconnect to a virtual desktop session consistently in two to five seconds at each patient location can easily save caregivers an extra twenty minutes or more every day. For healthcare providers with roaming caregivers who are forced to login and logout of PCs multiple times throughout the workday, the return on investment of an OnDemand Desktop ***virtual desktop management system*** can easily be high enough for the system to pay for itself within months and then continue contributing significantly to the bottom line.