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Ensim ServerXchange and Compaq Platforms – a Comprehensive Application Hosting Solution

Abstract

Service Providers face specific challenges when developing and deploying hosted application services. These challenges include finding and hiring skilled IT professionals, creating and delivering differentiated service offerings, and profitably operating a large scale hosting operation. Ensim and Compaq are working together to address these issues. Ensim ServerXchange on Compaq *ProLiant* servers provides a robust platform for rapidly deploying service plans, increasing effective server rack density, and reducing the complexity of managing an application hosting infrastructure.

This document provides information on features, deployment, and operation of the Ensim ServerXchange solution provisioning Compaq *ProLiant* servers running Red Hat Linux 6.1.

The target audience includes Hosting Providers who require rapid deployment and provisioning of service plans, increased utilization of Internet Data Center space, simplified application management solutions, quality-of-service guarantees and linkages of billing to application services.

Send your comments and questions on this solution or this document to activeanswers_support@compaq.com. Please include the Document Number (shown in the upper left corner of this page) in the Subject line of your message.

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Ensim ServerXchange and Compaq Platforms – a Comprehensive Application Hosting Solution
Technical Guide prepared by dotCOM and Service Provider Solutions

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1 Overview

Millions of small- and medium-sized businesses around the world are rushing to establish a presence and do business on the Web. The vast majority of these businesses will seek a service provider that can host, manage, and grow their online presence. In order to capitalize on this huge market opportunity, service providers must be capable of deploying hosted services for these businesses on a large scale. Ensim and Compaq directly address these challenges with Ensim's flagship product Ensim ServerXchange™ and Compaq *ProLiant* servers.

Ensim ServerXchange is the industry's first comprehensive *hosting operations platform* designed to enable hosting providers - including ISPs, ASPs and data center operators - to rapidly grow and efficiently operate large-scale hosting businesses. It is delivered as a rack-mountable appliance with a library of software suites optimized to offer full-featured easy-to-use hosted services for end customers. The ServerXchange hosting operations platforms allows hosting providers to centrally set-up and manage these hosted services. Hosting providers can download additional service plan suites through Ensim AppXchange™, a companion service that delivers upgrades and a pipeline of new hosting software suites.

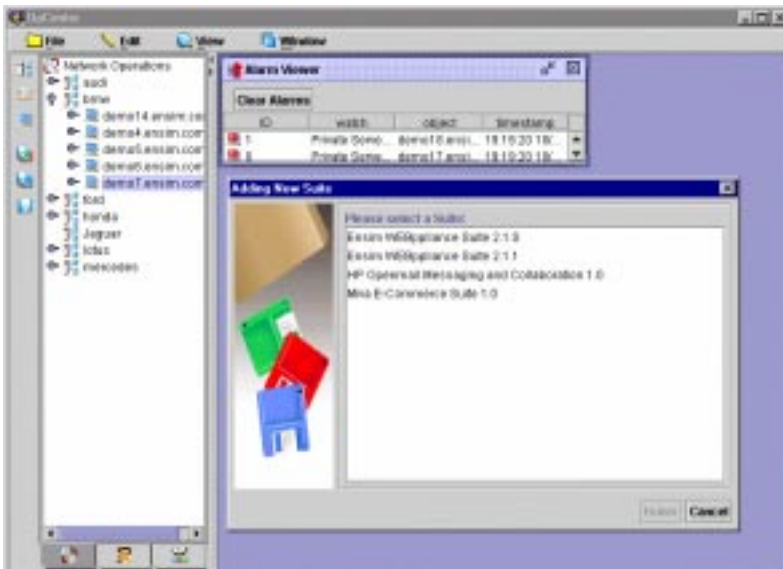
Typically, small- and medium-sized businesses purchase these bundled sets of applications in the form of "plans." Ensim ServerXchange makes the process of introducing new service plans and the provisioning of these plans effortless. With ServerXchange, service providers can continuously differentiate their service plans to stay ahead of the competition, and to quickly meet evolving customer needs.

1.1 Features

Ensim ServerXchange, is the industry's first comprehensive hosting operations platform designed to enable hosting providers (such as ISPs, ASPs and data center operators) to rapidly grow and efficiently operate large scale hosting businesses. Delivered as a rack-mountable appliance, ServerXchange gives hosting providers a unified view into their hosting environment, a mechanism for rapidly adding new and differentiated service plans, and a comprehensive portfolio of automation and customer self-administration tools.

1.1.1 Unified Data Center Management

The ServerXchange administrator console (OpCenter) is an easy-to-use hosting operations management console. It puts the hosting provider's Network Operations Center (NOC) staff in complete control of the service-delivery server farm. From a single console, the NOC manager can bring servers under management, provision plans on those servers for customers, adjust plan parameters for a customer over time, and even move a customer's service plan from one server to another with a single point, click, and drag operation.

Figure 1. The ServerXchange Administrator Console

Complex multi-server software upgrades or network configuration changes can be effortlessly orchestrated from the administration console. With very little technical know how, less-experienced data center staff members can manage the daily operations of a hosting business, allowing more highly skilled technical staff members to focus on high-value activities such as high-quality customer service, defining new plans and preparing the additional data centers.

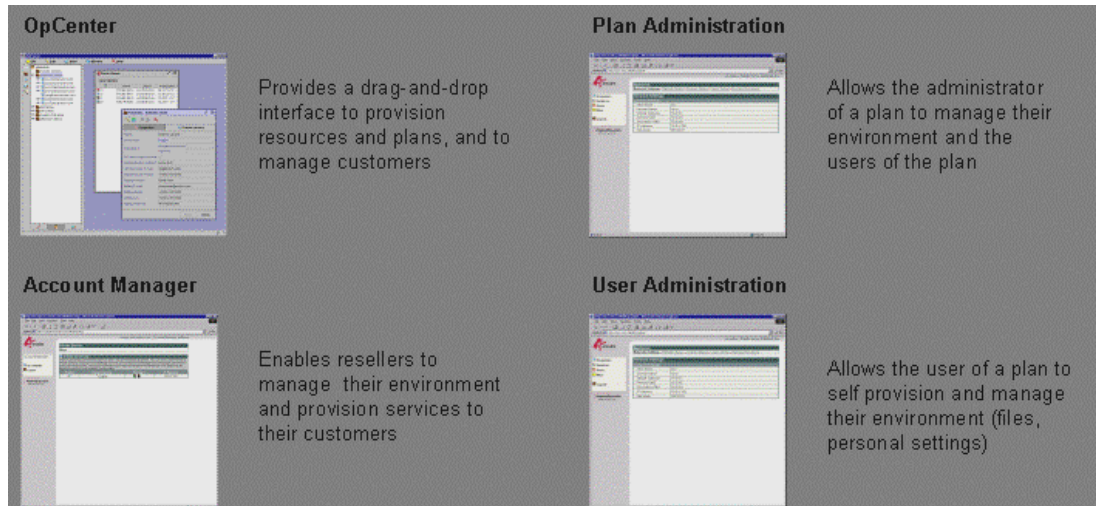
1.1.2 Reseller and End-Customer Self-Administration

In addition to the comprehensive ServerXchange administrator console (OpCenter) provided for the NOC staff, ServerXchange offers multiple levels of self-administration support for resellers, administrators, and users of ServerXchange-based hosting service plans.

Resellers: Web-based interfaces give resellers access to and control over the plans and resources provisioned for them by the data center operator. Within service provider-defined boundaries, resellers can manage their business and provision hosting plans for their customers.

Plan Administrator and Users: Within the context of their purchased plan, both designated plan administrators and end users have access to Web-based control panels that allow them to perform routine administrative tasks without relying on their reseller or their upstream hosting provider.

For example, a designated site administrator of a ServerXchange-based Web hosting plan can manage site content, add, delete and manage new site users, add email accounts, aliases and responders, monitor site usage, adjust site features such as anonymous FTP, and perform routine maintenance such as backing up and restoring files. Likewise, the end users of this plan can manage their own accounts, including file management, setting email vacation messages, and backing up and restoring their own files.

Figure 2. ServerXchange Interfaces for Provisioning and Self-Administration

1.1.3 Automation, Integration, and Customization Support

ServerXchange allows hosting providers to automate many of their day-to-day operations through a well-documented command line interface (CLI). The CLI is designed to automate the mass management of a large number of servers, service plans, and customers and supports direct input via the command line. Commands can also be compiled and passed in a specification file to ServerXchange.

The CLI can be used to perform the following functions:

- Install, update, and remove servers
- Create, move, remove, update, start, and stop service plans
- Add and remove customer records and update customer information
- Enumerate servers, plans, and various customer properties according to selected criteria
- Extract billing information

ServerXchange provides “hooks” enabling service providers to modify plan parameters or to integrate with other systems in the data center. These hooks are implemented by automating the execution of service provider’s custom code programming during the execution of critical ServerXchange processes. For example, when new plans are installed, a service provider may wish to update a DNS file. A documented, customer-modifiable script (which receives IP address and domain information) can perform this task. In addition to these customization “hooks,” ServerXchange enables the service provider to place their logo on customer-facing user interfaces and to adjust color schemes to project their brand image.

For more information, see the *Ensim ServerXchange User Guide*.

1.1.4 Offering New Service Plans

ServerXchange is delivered with a set of high-quality hosting plan software suites (best-of-breed application software) that serve as the basis for a full menu of differentiated service plans. A hosting plan software suite is a set of selectable applications such as Apache™, sendmail™, Bind/DNS™, FTP and HP Openmail™ that are pre-integrated to deliver a complete integrated hosting service plan. ServerXchange ships with the hosting plan software suites that are required to create the most popular classes of hosting service plans, such as:

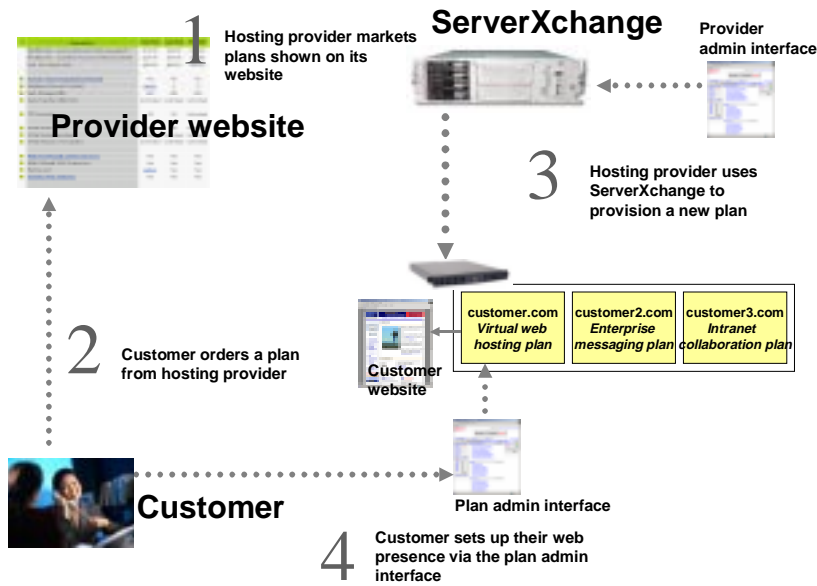
- Shared and Dedicated Web Hosting Plans
- Reseller Web Hosting “Appliance” Plans
- Shared and Dedicated E-Commerce Plans (featuring Miva™ Merchant™ and Impresa™)
- Enterprise Messaging Plans (featuring HP Openmail)
- Intranet Collaboration Plans (featuring Planet Intra™)

New hosting plan software suites, new applications for existing suites, and application upgrades are all instantly available via an Ensim AppXchange™ service download. More details about AppXchange are provided later in this document.

With ServerXchange, defining a new service plan is a point-and-click operation. The first step is to give a plan a name. Next, using OpCenter, the provider simply selects the desired subset of suite applications and settings for a software suite-specific collection of resource variables (for example, disk space, network bandwidth, and mailboxes). For example, an “Intermediate Shared Web Hosting” plan might include all the applications in a virtual hosting plan software suite, and resource settings of 20 email accounts, 50 MB disk space, and 3 GB of monthly data transfer, for \$19.95 per month.

When a customer arrives to purchase one of the advertised plans, the hosting provider uses the ServerXchange administrator console to deploy an instance of that plan. With a simple series of drag-and-drop operations, the appropriate software in the plan is sent from the ServerXchange appliance to a selected server in the data center. A ServerXchange agent on the server receives, installs, and appropriately configures the server and software based on the plan definition. Upon successful installation, a billable event is recorded, and the customer is notified their service is “on”.

Figure 3. Deploying Plans for Direct Customers with ServerXchange



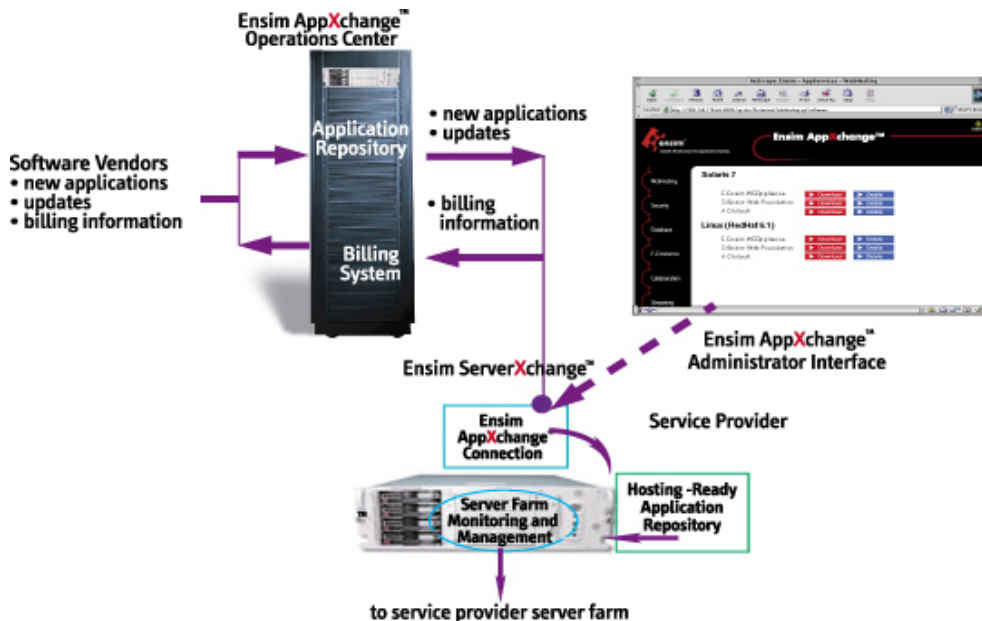
In addition to the user interface-driven plan provisioning process, ServerXchange offers extensive automation capabilities through simple scripting. These scripts can automate such actions including the deployment of new service plans, the adjustment of plan parameters, and the enumeration of a wide variety of server and plan state information, to support billing and monitoring. The automation enables a service provider, for example, to create a website from which customers can select a desired plan, enter payment information, then wait while back-end website scripts drive ServerXchange through the application installation and configuration process. In this scenario, the service provider has sold, installed, and configured a new service plan without involving a human, using a mechanism that works *regardless of plan type*.

ServerXchange also provides complete support for selling service plans through a reseller channel. Using a limited ServerXchange interface, resellers are empowered to define, sell, and manage plans for their customers without requiring day-to-day interaction with their upstream hosting provider.

1.1.5 Ensim AppXchange – Accelerating the Introduction of New Offerings

AppXchange is a companion service to the Ensim ServerXchange hosting operations platform. Accessed through a ServerXchange management interface, AppXchange is an enabling tool that allows hosting providers to continually update and enhance their portfolio of hosted services for their customers. AppXchange combined with the streamlined ServerXchange plan definition and deployment process, dramatically reduces the complexity traditionally surrounding the introduction of new service plans into the service provider menu of offerings.

Figure 4. Ensim AppXchange



In addition to software delivery functionality, AppXchange substantially simplifies the process of software licensing and billing. Through pre-negotiated volume purchase agreements with software vendors, Ensim can pass substantial software licensing savings to the service provider. In many cases, these agreements enable a “pay as you go” model, allowing the service provider to match software expenditures with hosting plan revenue, thereby simplifying cash flow management.

1.1.6 AppXchange Suites and Applications

Currently, Ensim AppXchange allows hosting providers to deploy the following service plans:

- Shared and Dedicated Web Hosting Plans
- Shared and Dedicated E-Commerce Plans (featuring Miva Merchant™ and Impressa™)
- Enterprise Messaging Plans (featuring HPOpenMail™)
- Intranet Collaboration Plans (featuring Planet Intra™)
- Reseller Hosting Appliance (featuring Ensim Webpliance™)

1.1.6.1 Shared and Dedicated Web Hosting Plans

The **Ensim Web Foundation Suite** provides everything needed to create a rich set of dedicated and shared hosting plans. It includes five popular server software packages (Apache Web server, mail server, remote login, file transfer and server-side scripting languages such as Python, PHP and Perl), several Web-based applications including calendar, discussion and chat, and a full-featured Web log analyzer to provide insight into the traffic visiting the hosted site.

1.1.6.2 Ensim E-Commerce Plans

The **Ensim E-Commerce Suite** is built around Miva Merchant, a browser-based storefront development and management system. It integrates cataloging, product fulfillment, maintenance, category management, shopping basket, order, and credit card processing. E-merchants can use the browser-based interface to build stores instantly. The Ensim E-Commerce Suite offers merchants a one-stop e-commerce solution with everything needed to establish an e-commerce presence online, ranging from tools to quickly and easily build a storefront to the support of secure transactions.

1.1.6.3 Enterprise Messaging Plans

The **Ensim Enterprise Messaging Suite** allows hosting providers to immediately offer profitable hosted enterprise messaging solutions. It offers providers a simple way to easily migrate their customers from free email services such as basic sendmail to a higher-value messaging service. The base component to the Ensim messaging suite is HP OpenMail. With an installed base of more than 15 million seats, OpenMail is installed in 60% of the Fortune 1000, and it is the number three business-messaging solution.

Used in conjunction with the Microsoft Outlook client, OpenMail is the only non-Microsoft server that provides comparable levels of collaboration functionality to Microsoft Exchange, including calendar, group scheduling, tasks, and mailbox delegation. With OpenMail, end users get the reliability and scalability of a Unix messaging platform as well as the functionality of a Microsoft Exchange server and the familiar Microsoft messaging tools.

1.1.6.4 Intranet Collaboration Plans

The **Ensim Intranet Collaboration Suite** is built around the Planet Intra instant intranet solution. The solution is targeted at business customers looking for a powerful internal communication and collaboration platform. It maximizes productivity by simplifying the information-sharing process, increases workflow efficiency and improves communication between remote offices and mobile workers. Users can post, share, and edit Web pages and documents as well as conduct discussions and share calendars and contacts easily, and without technical know-how.

1.1.6.5 Reseller Hosting Appliance

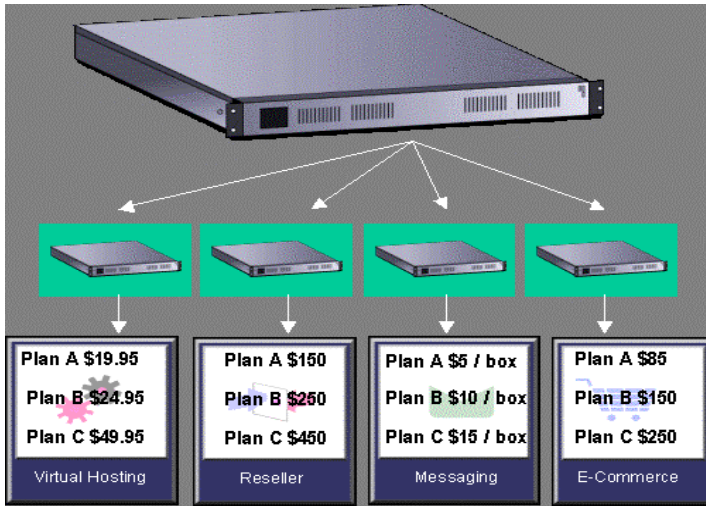
Ensim Reseller Web Hosting Appliance Plans makes it easy for hosting providers to create a reseller channel. Using the Ensim Webpliance product, hosting providers can create “virtual appliances” on one server and give resellers the ability to sell virtual domain plans to end-user customers. At the same time, resellers benefit from a comprehensive set of intuitive graphical user interfaces that delegate sufficient control so they can manage their own domains and provide their end-users with responsive customer support for their individual websites.

For more information on additional appliances, suites, and applications, see the Ensim website (<http://www.ensim.com/>).

1.1.7 Ensim instantServer™ Technology

Ensim instantServer technology enables a service provider to create multiple virtual “private servers” on a single server. Before Ensim instantServer technology, service providers were forced to dedicate an entire physical server to a customer to make absolute guarantees about service plan performance and inter-subscriber privacy and security. Dedicated servers were also mandatory to offer service plans based on application software that neither directly supported multiple simultaneous users nor supported the simultaneous execution of multiple application copies on a single server.

Figure 5. Ensim instantServer Technology Illustrated



Ensim is currently in pursuit of 25 technology patents (as of October 2000) related to its pioneering work in shared hosting technology, security in shared server environments, and enforcement of service level agreements in a shared server environment.

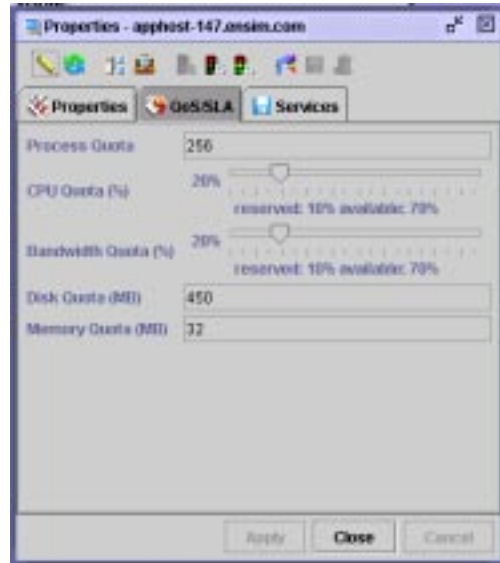
1.1.7.1 Guaranteeing Private Server Security

Each service plan utilizing a private server is guaranteed a minimum amount of physical server resources (memory, CPU and network bandwidth and storage). For example, a plan subscriber may be guaranteed 20 MIPS of CPU, 300 KB/s of network bandwidth, 16 MB of memory and 2 GB of disk space. A subscriber to this plan will be guaranteed, *at minimum*, a level of performance that would be obtained from the same software running on a dedicated server with the same available underlying resources, regardless of other activities on the server. When excess system resources are available, they are allocated fairly across all customers. Thus, users will, on average, obtain performance above what would be expected from a similarly resourced dedicated server.

1.1.7.2 Operational Flexibility

While an Ensim Private Server provides, at a minimum, performance parity with a similarly configured dedicated server, it provides a higher level of operational flexibility. Ensim instantServer makes it easy for hosting providers to dynamically adjust the resource settings for a plan based on customer needs.

For example, if an existing reseller needs more processing power after enhancing a site with complex PHP or ASP-generated content, the hosting provider could allocate extra bandwidth to that reseller instantly, by simply sliding a bar on the ServerXchange administrator interface. If a customer wanted to upgrade to a dedicated server, it is accomplished using a single drag-and-drop operation.



And when a customer moves to a different server, their plan automatically “travels” with them, including all their applications, data, their IP address, and other server-related configuration settings. Once the move is complete, the Private Server is restarted and their plan is brought back online. Outside of the increase in site performance, the customer will be unaware that the underlying server has changed.

1.1.7.3 Support for Multiple Configurations within One Server

Ensim’s instantServer technology gives service providers the flexibility to offer secure hosting plans with guaranteed service quality, without dedicating an entire server to the subscriber – *even when offering a service-based on application software that traditionally required a dedicated physical server*. Different service plans (or different instances of the same type of plan), each residing on an Ensim Private Server and running on the same physical server can host separately configured hosting plans. For example, customers hosted on the same server can maintain their own configurations for the mail and Web servers of their customers.

1.1.7.4 Fault Isolation and Instant Recovery from Server Failure

A fault generated by a customer service plan in a Private Server does not impact other plans or customers hosted on the same underlying physical server. Private Servers can be independently started, stopped, and started without having to start, stop, or restart the host server.

Plan configurations are maintained in a centralized database on the ServerXchange appliance. If a server were to fail, and the customer’s data was stored on a network-attached storage device, the administrator would simply move the customer’s plan to a healthy server (via drag-and-drop function), returning them to service in a matter of minutes. (See Section 3.2 for more information on data backup and recovery)

1.2 Summary of Benefits

Ensim ServerXchange provides a complete management and operations platform that enables hosting providers to build and operate a scalable and highly profitable hosting business. A summary of key benefits is described below:

1.2.1 Decreased Operational Expenses

As a comprehensive hosting operations platform, ServerXchange automates the majority of data center operational routines that were previously conducted manually. Tasks such as service plan provisioning, deploying applications, and moving customers across physical servers can be completed with ServerXchange's drag and drop capability.

1.2.2 Reduced Customer Support Expenses

ServerXchange offers multiple levels of self-administration for resellers and end-customers. These GUI control panels decrease the number of service requests a hosting provider receives since customers can self-manage their accounts.

1.2.3 Increased Revenue and Competitive Differentiation

With ServerXchange, defining and deploying new revenue generating service plans is a point and click operation. When combined with ServerXchange's best-in-class software suites, hosting providers can instantly deploy new service plans in response to changing customer demands and market conditions.

1.2.4 Increased Revenue and Profit per Square Foot of Rack Space

With Ensim's instantServer technology, hosting providers can now host multiple service plans or customers on a single physical server. For the first time, service providers can maximize their utilization of server resources and hosting operations floor and rack space.

2 General Physical Server Sizing Guidelines

The following sections provide recommendations for hardware platform configurations and operating system requirements.

From testing performed by Ensim, the following minimum guidelines for a physical Linux server are provided:

- Pentium III CPU, 500 MHz or higher (single processor)
- 256 MB of RAM
- Any NIC supported by Red Hat 6.1
- At least 10 GB disk space (IDE, SCSI, and SCSI adapter must be supported by Red Hat 6.1)
- Red Hat 6.1 with a minimum of:
 - “Networked workstation” base configuration component
 - Sharutils RPM package
 - Hardware Raid Device (Optional - must be support during Red Hat installation)

When partitioning the disk, Ensim recommends the following, along with large drive partitions to store the private server file systems:

- Minimum 256 MB swap, more if space allows – recommend two times the amount of physical memory on the system.
- Minimum 1GB available in /usr partition
- 50 MB of space on /boot partition
- Allow / partition to grow to fill remaining disk

2.1 Recommended Compaq Configurations

This section describes three (3) Compaq configuration options that have been tested with the Ensim Solution v2.1. The three configurations are offered to provide different levels of RAID support for the solution using internal storage capacity.

Table 1 provides a dual-drive raid configuration using Compaq *ProLiant* DL380 system. This configuration would be used in scenarios to mirror the system spindle and provide a separate mirrored spindle for the data, Web content, and virtual servers. Consult <http://www.compaq.com> to verify the current part numbers for these components.

Table 1. Dual-Drive RAID Compaq Configuration

Hardware Platform	<i>ProLiant</i> DL380 800/256K (128 MB default) Compaq NC3163 Fast Ethernet embedded with system	160553-001
Memory	1024-MB PC133MHz Registered ECC SDRAM DIMM	128280-B21
Disk	9.1 GB Wide Ultra3 SCSI 10,000 RPM drive for operating system, swap space and required components – QTY 2 36.4 GB Wide Ultra3 SCSI 10,000 rpm Drive for application data files (approx.: 500MB/private server functioning as a Web server) and Web content data – QTY 2	142671-B22 176496-B22
Operating System Notes	<p>Red Hat Linux 6.1, at a minimum installed with the following RPMs:</p> <ul style="list-style-type: none"> • “Networked workstation” base configuration component • Sharutils RPM package <p>The system device is two 9.1 GB drives configured in a hardware RAID 1 using the Smart Array controller . The drives are partitioned as follows:</p> <ul style="list-style-type: none"> • 40 MB partition for Compaq Utilities • 50 MB partition for /boot directory • 2048 MB swap partition • Root partition to fill remainder of disk <p>The data device is two 36.4 GB drives configured in a hardware RAID 1 using the Smart Array controller. The drives are partitioned as a single /home directory partition to fill the entire spindle. This is the location for all of the virtual servers and Web content.</p>	

Table 2 provides a singular drive raid configuration using Compaq *ProLiant* DL360 system. This configuration would be used in scenarios to mirror a combined system and data spindle to provide the most reliability using a 1U server with internal data storage. Consult <http://www.compaq.com> to verify the current part numbers for these components.

Table 2. Single-Drive RAID Compaq Configuration

Hardware Platform	<i>ProLiant</i> DL360 800/256K (128 MB default) Compaq Dual NC3163 Fast Ethernet embedded with system	161080-001
Memory	1024-MB PC133MHz Registered ECC SDRAM DIMM	128280-B21
Disk	36.4 GB Wide Ultra3 SCSI 10,000 rpm Drive for application data files (approximately 500MB/private server functioning as a Web server) and Web content data – QTY 2	176496-B22
Operating System Notes	<p>Red Hat Linux 6.1, at a minimum installed with the following RPMs.</p> <ul style="list-style-type: none"> • “Networked workstation” base configuration component • Sharutils RPM package <p>The system device is two 36.4 GB drives configured in a hardware RAID 1 using the Smart Array controller. The drives are partitioned as follows:</p> <ul style="list-style-type: none"> • 40 MB partition for Compaq Utilities • 50 MB partition for /boot directory • 2048 MB swap partition • 6144 MB Root partition • /home directory partition to fill remainder of disk <p>Installation for RedHat 6.1 and the Ensim Solution in this configuration will require updated SmartArray drivers, and PCI support from Compaq in addition to updated kernel modules from Ensim.</p> <p>The Compaq modules can be downloaded from http://www.compaq.com/support.</p> <p>Contact Ensim Support Staff at 1-877-MY-ENSIM for the new kernel modules.</p>	

Table 3 provides a dual-drive *nonRAID* configuration using Compaq *ProLiant* DL320 system. This configuration provides reliable configuration isolating system information from Web virtual server content in a 1U server configuration with internal storage. This storage configuration does not provide hot-plug capability for the storage components. Consult <http://www.compaq.com> to verify the current part numbers for these components.

Table 3. Dual-Drive NonRAID Configuration

Hardware Platform	<i>ProLiant</i> DL320 800/256K (128 MB default) Compaq Dual NC3163 Fast Ethernet embedded with system	201502-002
Memory	512-MB PC133MHz Registered ECC SDRAM DIMM QTY: 2	128279-B21
Disk	9.1 GB Wide Ultra3 SCSI 10,000 RPM drive for operating system, swap space and required components QTY 1 18.2 GB Wide Ultra3 SCSI 10,000 rpm Drive for application data files (approx.: 500MB/private server functioning as a Web server) and Web content data – 18.2 GB drive included in base system configuration	142672-B21
Operating System Notes	Red Hat Linux 6.1, at a minimum installed with the following RPMs: <ul style="list-style-type: none"> • “Networked workstation” base configuration component • Sharutils RPM package <p>The system device is a single 9.1 GB drive. The drive is partitioned as follows:</p> <ul style="list-style-type: none"> • 40 MB partition for Compaq Utilities • 50 MB partition for /boot directory • 2048 MB swap partition • Root partition to fill remainder of disk <p>The data device is a single 36.4 GB drive. The drive is partitioned as a single /home directory partition to fill the entire spindle. This is the location for all of the virtual servers and Web content.</p>	

Compaq participates in the Red Hat Linux Hardware Certification Program, and Compaq engineers routinely review Compaq hardware and drivers to ensure compatibility with Linux.

Notes:

- The current release of the ServerXchange solution requires the physical server to be a single CPU system.
- Although the systems will support more than 1 GB of physical memory, the current release of this solution is configured to only support 1 GB of physical memory.
- When configuring your network connectivity, be sure to use the first Ethernet device for your primary network traffic (that is, eth0).
- Be sure to create a valid user account that can be remotely accessed for the Ensim solution to be deployed.

2.2 OpCenter

Ensim recommends the following configuration information to run the OpCenter administrator console from a Microsoft Windows desktop.

- Operating System – Windows NT 4.0 Workstation with Service Pack 3 or greater or Windows 2000 Professional
- CPU – Pentium II 233 MHz
- Memory – 128 MB
- Hard Disk – 30 MB
- Screen – 1024 x 768 screen resolution, 15-bit color or above

3 Installing the Solution

3.1 Installing ServerXchange

The next three subsections discuss briefly the installation and setup time, installation prerequisites, and verification that will provide a complete solution. (For more information see the Ensim ServerXchange User Guide)

3.1.1 Setup Time

Briefly the solution installation requires the following tasks:

- Installation and setup of the Ensim ControlCenter appliance
- Software installation of the OpCenter Administration Console on the administration system
- Installation and setup including RedHat 6.1 on the initial physical server to provide virtual hosting / private server services.
- Provisioning the initial physical server via the OpCenter Administration Console.

Installation and setup of the initial physical server, OpCenter Administration Console and the ControlCenter appliance should take 30 minutes or less and then the Service Provider will be fully operational. It is assumed the base operating system (Red Hat Linux 6.1) is installed on the physical server prior to configuring the ServerXchange software.

A new private server setup on a ServerXchange-enabled physical server can be completed in as little as three minutes.

3.1.2 Ensim ServerXchange Installation Prerequisites

This section assumes the ServerXchange solution is being installed in an existing Service Provider infrastructure with a defined DNS server. For details on requirements regarding network connectivity with Firewalls installed, see Section 3.3 . Listed below are the resources necessary to complete the installation of the solution.

Ensim-provided ControlCenter appliance:

- UTP network connectivity
- IP, Netmask and Gateway, DNS server address for this appliance (reverse DNS lookup)
- Administration Station with a Web Browser installed and Java enabled (OpCenter console).
- IP, address and username and password for ControlCenter FTP backup system (see Section 3.2 for more details)
- Email address for administrative alerts
- Registration username and password (provided with appliance)

OpCenter Administration Console:

- Network enabled Windows, or Linux based system capable of running Java applications

3.1.3 Physical Server to be Provisioned (for Example, Compaq ProLiant DL380):

Before provisioning the Linux physical server, Ensim recommends the following information be at hand:

Type of Information Needed	Site Specific Information
Root password:	
Valid user account:	
Valid user account password:	
Host Name of physical server:	
IP address of physical server: Forward and reverse DNS entries are required. The ControlCenter will need to be able to telnet to this system initially.	
Default gateway:	
Subnet mask:	
Primary DNS:	
Secondary DNS:	
Type of hardware architecture for Linux platform:	
Directory path for virtual / private server root directory.	
Host Name of virtual server:	
IP address of virtual server: Forward and reverse DNS entries are required.	

3.2 Data Backup and Recovery Scenarios

While it is expected that the Service Provider has processes in place for data backup and recovery of system content, the ServerXchange solution has the ability to automatically backup and restore the configuration database of the ControlCenter.

When ServerXchange ControlCenter is installed, the Service Provider must supply an FTP address/directory for backups. ServerXchange automatically backs up the ControlCenter database server every 10 minutes for all critical-state information and raises an alarm if the backup fails.

The following information is stored in ControlCenter:

- Private Servers
 - QoS Values
 - Network Settings
 - root and admin passwords
 - Installation location
- Physical Servers
 - Platform Type
 - Accounting Information
 - Private servers deployed on a given physical server

- Customers
 - Billing Information
 - Contact Information
 - Account Manager Login/Password
 - Private servers belonging to a customer
- Applications
 - Applications available for deployment
 - Applications installed on a given private server

It is recommended the administrator create a unique username and directory specifically for this backup process. Multiple ControlCenter appliances cannot share the same directory for the location of the backup data.

When planning the amount of storage needed, here are the basic specifications for the backup system.

1. One backup per hour of approximately 500 KB to 1.5 MB in size is required.
2. One file per hour is stored, and, at end of day, the last remaining file is stored. You have one file at the end of day of 500 KB to 1.5 MB.
3. All services are backed up once per week. This can be hundreds of MB depending on the number of services installed.

Service Providers will need approximately 100 MB per day to store the services. After the first few days, the backup requirements grow very slowly (logarithmically) over the course of a couple of years. It doesn't maintain any backups more than two years old.

The backup algorithm results in the system always having backup files available for (approximately):

- Every hour
- 2, 4, 8, 16, 32 hours ago
- 3, 6, 12, 24 days ago
- 2, 4, 8, 16 months ago

Note: ServerXchange *does not* backup and restore the Service Provider's physical servers, private servers, or domains.

3.2.1 Failover of Private Servers

The ServerXchange solution has the ability to quickly keep a service available to the Internet users in the event of a failure of the physical server. Proper planning for the feature requires the content data be made available via a network storage system.

Using the OpCenter console, in the event of a failure, the administrator can drag and drop a private server to a different physical server (or several servers). ServerXchange will automatically configure the new server (and the hosted private servers) to duplicate the failed servers (functional equivalence). Service is then automatically restored.

ServerXchange can be paired with a backup server for failover support or to a remotely hosted server at Ensim's operations center for off-site failover. If the ServerXchange unit fails, all private servers in the server farm continue to operate, so customer applications are unaffected.

3.3 Using ServerXchange with Firewalls

This section addresses using ServerXchange in possible firewall configurations that may apply to the network environment. Ensim and Compaq recommend putting ServerXchange behind the firewall as detailed in Section 3.3.3 .

3.3.1 Communication

The ControlCenter uses multiple ports for communication:

- 19635 – Physical server SSH protocol Port
- 19638 – Account Manager
- 22 – Billing protocol to connect to Ensim's billing server

The preceding ports need to be opened if a firewall is installed between the ControlCenter and the public Internet.

ServerXchange uses SSH for secure communication between itself and all the physical servers it manages. All Billing information sent to Ensim is also encrypted via a SSH session.

CAUTION: The OpCenter administration console communication protocol, however, is not encrypted and should be run only behind the firewall. The most secure configuration is with the firewall between the network and everyone, administrator inside the firewall. See Section 3.3.3 .

3.3.2 No Firewall

This configuration requires no changes because all ports are open.

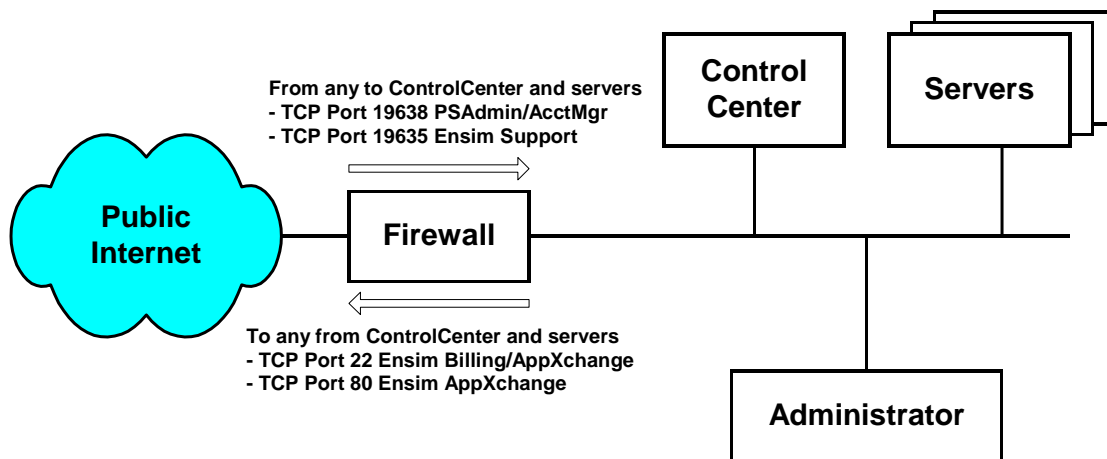
3.3.3 Firewall between Network and Everyone, Administrator inside Firewall

The following firewall rules apply in addition to the Service Provider's existing rules.

- From any to ControlCenter and servers
 - TCP Port 19638 PSAdmin/AcctMgr
 - TCP Port 19635 Ensim Support
- To any from ControlCenter and servers
 - TCP Port 22 Ensim Billing/AppXchange
 - TCP Port 80 Ensim AppXchange

Figure 6 illustrates the configuration.

Figure 6. Administrator inside Firewall (Recommended)



FIREWALL-CFG1.VSD

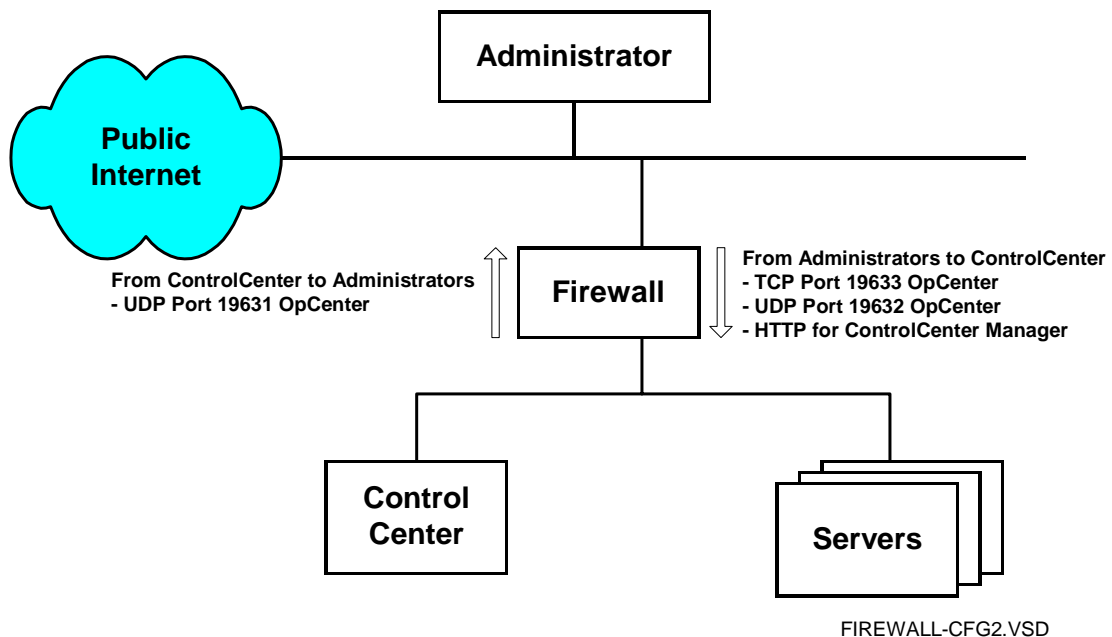
3.3.4 Firewall between Network and Everyone, Administrator outside Firewall

In addition to existing firewall rules, include all the rules from the preceding section and the following:

- From ControlCenter to administrators
 - UDP Port 19631 OpCenter
- From administrators to ControlCenter
 - TCP Port 19633 OpCenter
 - UDP Port 19632 OpCenter
 - HTTP for ControlCenter Manager

Figure 7 illustrates the configuration.

Figure 7. Administrator outside Firewall



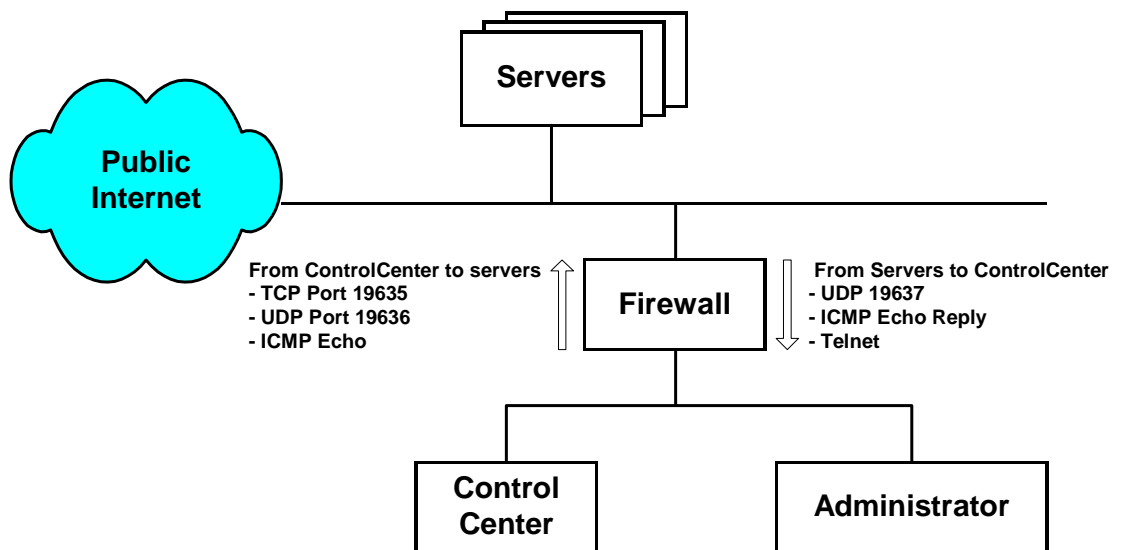
3.3.5 Firewall between ServerXchange ControlCenter and Server Network

In addition to your existing firewall rules, include the following.

- From ControlCenter to servers
 - TCP Port 19635
 - UDP Port 19636
 - ICMP Echo
- From servers to ControlCenter
 - UDP 19637
 - ICMP Echo Reply
 - Telnet

Figure 8 illustrates the configuration.

Figure 8. Administrator and ControlCenter inside Firewall



FIREWALL-CFG3.VSD

3.4 Ordering Information

3.4.1 Ordering ServerXchange

To order ServerXchange, please call 1-877-MYENSIM (1-877-693-6746) and ask for Sales. You can also visit the Ensim website at <http://www.ensim.com/>.

3.4.2 Obtaining Additional ServerXchange Information

For more information about ServerXchange, contact William Auchincloss, Ensim Corporation at 1-408-541-4419 (wauchincloss@ensim.com).

For additional information about the Compaq technical evaluation of ServerXchange, call 1-800-289-5986. Send global inquiries to serviceprovider@compaq.com.

3.4.3 Ordering Compaq *ProLiant* DL380 Servers

To order *ProLiant* servers, contact a local reseller or purchase them online at <http://www.compaq.com/products>.

Appendix A. Frequently Asked Questions

These questions and answers about ServerXchange are organized into the following categories:

- General
- OpCenter
- ControlCenter
- Private Server
- Physical Server Requirements and Resource Allocation
- Applications
- Linux Kernel

A.1 General

Q. How does Ensim suggest using ServerXchange?

A. We suggest that you use a private server for hosting virtual websites, e-commerce, messaging, streaming or intranet hosting. For virtual Web hosting, Ensim recommends creating private servers with about 200 virtual customers per private server. The private server can be resold to a company/person who sells virtual hosting. Our software does not limit the number of virtual sites/private servers that can be installed. Such limitations will be related to the hardware you choose.

Q. Where should the reseller's customers point their SMTP servers?

A. Sendmail will only relay mail coming from hosts that have the same domain name. To allow relaying from other hosts, the reseller must create/edit the `/etc/mail/relay-domains` file and add hosts, domains and IP addresses.

Q. What ports do I need to have open in my Firewall for Ensim Corporation to support my ControlCenter?

A. You should allow port 22 to connect to `billing.ensim.com` and allow 19635 to your server farm for Ensim to connect to your servers for support.

Q. What do you mean by saying that each customer is isolated?

A. No one can see each other's files, processes or other information. It is as if they were on different machines. One customer cannot hog all the Physical Server's resources (CPU, network bandwidth, disk space).

Q. Can customers download and run unmodified Linux application? What permissions they have for binding ports, etc.?

A. Yes, the customers can download and enjoy binary compatibility. Only the root and admin user can bind to ports under 1024.

Q. Can I customize the services we install to print "My Company Name" and Logo everywhere?

A. Yes, you may customize installed services. Check out the *ServerXchange User Guide* on customizing services and Private servers.

Q. How does my customer increase the Quota for a websites added to a private server?

A. The customer can login to Private Server Admin and simply increase the Disk Quota for the user assigned to the Virtual Host. This can also be done for the customer using the Webpliance Appliance Administrator.

A.2 OpCenter

Q. Where do I get OpCenter or additional manuals for my Admin Staff?

A. Go to <http://www.ensim.com/documentation>. There you will find OpCenter and user manuals to download.

Q. I change the QoS values in a Private Server, but it has no effect.

A. Reboot the Private Server in order to activate the new QoS values.

Q. OpCenter says it cannot contact ControlCenter. What should I do?

A. Please check for network connection and configuration, ControlCenter hostname or IP address typo, and if ControlCenter is active and running.

Q. Which control interface can the admin, customers, and users access?

- A. OpCenter = admin access
 Account Manager = Customers/Reseller access
 Private Server Admin = Customer/End User access

Q. What kind of billing information can be collected?

A. Ensim wrappers allow a software vendor to collect usage information for pricing purposes. ServerXchange base functionality provides for delivery back to the AppXchange billing center information regarding how many private servers are running on each physical server, which applications are running and how long they have been operational.

A.3 ControlCenter

Q. Do I need to have working Host Names setup in DNS for all this to work.

A. IP-to-name (reverse DNS lookup) must match the output of the “hostname” UNIX command run from the machines shell. Note: This must also be true for any private servers that will be running the OpCenter Web Service.

Q. Why do I need command line? How can I use it?

A. Our command line tool is tailored not for human use but something to be added into scripts. This way you can do large complex operations, like start all servers, or upgrade all services in one command. Check the command line documentation at Appendix A of the *ServerXchange User Guide*.

Q. My Private Server starts and then turns red. What happened?

A. The most common problem is the input of wrong netmask or gateway address.

Q. My Private Server is moved, starts and then turns red (crashed). What is going on?

A. The most common reason is that you moved the Private Server to a different network and have not updated the IP address accordingly.

Q. What does the Process Quota mean?

A. This is the maximum number of simultaneous user process a Private Server can have at a time

Q. How do I change the IP address of a ServerXchange Physical Server?

A. First you must log into the actual physical server, run linuxconf (or whatever tool you feel most comfortable with), and do the IP Address update. Then go to OpCenter and change the IP address there. Between the two updates, no operations can be performed on the Physical Server. The ControlCenter will think that it is down until you update the IP address.

A.4 Private Servers

Q. What happens when customers exceed the allocated private server resources?

A. The customer automatically begins accessing any free resources available at the time.

Q. What happens to the private servers if the physical server goes down?

A. The configuration information (for the NFS and which applications are installed) resides in the ServerXchange ControlCenter. When a physical server goes down, it generates an alarm. You can then drag and drop the server to a different physical server and the ControlCenter will immediately configure the new server to be an exact duplicate of the failed one.

Private servers need not be mirrored to another physical server. A private server can be moved even when the physical server on which it resides is down. If you are storing data locally, you will have to take the disk out of the failed server and swap it with the disk in the new physical server. If, on the other hand, you are using an NFS like Legato or Network Appliance, the ControlCenter houses all of the information that is needed for the restored server to connect to the NFS.

As soon as you drag the private server to a new physical server, automated setup begins. In about three minutes, the process is complete, and the server is restored. The relocation is completely transparent to the user.

Q. Can a private server span physical machines?

A. Ensim ServerXchange is interoperable with load balancing and clustering solutions but does not itself provide this functionality. ServerXchange is specifically designed to enable and support the setup, operation and management of application and customer multi-tenancy on a single server.

Q. When you move a private server, can it keep its IP address?

A. Yes. When a private server is dragged and dropped from one physical server to another, either to recover from a physical server failure or to provide more server resources to a customer, all critical states, including IP address, travel with it.

Q. Can I give my customers root access to their private servers?

A. Yes. Ensim has exposed root capability to private server owners, with a few limitations to ensure private server isolation, privacy and security. A private server owner cannot access or observe operation of another private server (nor will the user necessarily know they are being hosted in a multi-tenancy environment). In addition, a private server user/owner cannot drive server resource availability of another private server below its minimum guarantee.

Q. How do I remove a Private Server once the Physical Machine is gone?

A. Disable the Physical Server in the OpCenter, then delete the PvtSvr.

A.5 Physical Server Requirements and Resource Allocation

Q. Will this solution support more than one network card?

A. Yes, if the public network card is named "eth0," the solution will support one card for incoming net traffic and another for NFS traffic. The private server will see only the public traffic and not the interface on the private network.

Q. Can it work with dual-NICs?

A. Yes, but the NIC that is used for the Service Provider's administrative tasks does not allow for sharing bandwidth. The NIC used to communicate with customers would be able to set bandwidth by customer.

Q. Does this solution support SMP servers?

A. This solution currently supports SMP operation on Solaris servers. Ensim does not currently support SMP operation on Linux servers.

Q. What does CPU / Net Quota really mean?

A. CPU Quota can mean two different things depending on your configuration. If MaxLimit is turned off, the CPU Quota refers to the Minimum Guaranteed CPU a Private Server can get. This means that no matter how heavy the other Private Servers (on the same physical server) are hit with requests, this Private Server will get at least that much CPU. If MaxLimit is turned on, that means that the Private Server cannot get more than the quota either. Net Quota works similarly to the CPU Quota with MaxLimit turned off. If every Private Server on the Physical Server is sending at their maximum rate, then they will get according bandwidth ratios. But they are still guaranteed the min

Q. What is the minimum system configuration?

A. CPU (only supports one processor), Netgear or other tulip-based NIC or Intel EtherExpress Pro, 10GB Fast/7200RPM IDE hard drive & 256MB RAM.

A.6 Applications

Q. Are multiple copies of the applications required?

A. Yes. A copy of each application resides on the physical server, and a copy is dragged and dropped to each private server.

Q. Can a Service Provider create a wrapper for applications it already has?

A. Yes, this capability is available through AppXchange, included with ServerXchange. AppXchange also allows Ensim to retrieve billing and end-user usage information and demographics to share with Service Providers.

Q. Can private servers run off-the-shelf, unmodified applications designed for the target operating system?

A. Yes and without source code modification. Neither operating system nor application source code is required for Ensim to bring manageable, multi-tenant, off-the-shelf application hosting to standard Linux and Solaris servers.

Q. How does this solution handle multi-tier applications?

A. Several customers and partners are using ServerXchange to reduce the number of servers required to host multi-tier applications. By hosting application tiers on private servers, the number of physical servers required to host a complete multi-tier application is substantially reduced, and manageability is substantially increased. Content distributors have even used ServerXchange to host tier 1 (of multi-tier applications) at the edge of the network. Reducing server count and increasing manageability as more services migrate to the edge (and by extension, as points of presence at the edge increase) is required to make this model sustainable and viable.

Q. What is required to install my own applications?

A. Ensim private servers run off-the-shelf, unmodified applications. Installing and managing these applications is handled exactly as if the private server were a physical server. To gain the benefits of drag-and-drop or fully automated setup, operation and management of hosted applications, an Ensim application wrapper can be paired with an off-the shelf application.

An Ensim application wrapper enables an off-the-shelf application to run on the ServerXchange platform. A wrapper coordinates the installation, management and usage metering of the application in a private server, thereby substantially reducing the administrative burden required to use the application in a hosting environment. Ensim makes available a clear specification for wrapping an application for ServerXchange deployment. Either Ensim or a software vendor can create these wrappers. The time required varies from a few hours to several days depending on the complexity of the application.

A.7 Linux Kernel

Q. Is it necessary to modify the operating system or application?

A. No.

Q. Are multiple copies of the operating system required?

A. No. A single copy is used across the private servers.

Q. Is it necessary to modify the kernel or access the source code to create the private servers?

A. No, the kernel isn't modified, and no access to source code is required.

Q. Which platforms does ServerXchange support?

A. Ensim ServerXchange currently supports Linux Red Hat 6.1 on Compaq *ProLiant* servers.

Q. Can I use any version of the Linux kernel?

A. No, we officially support Linux 2.2.12-20 in the current release.

Q. Does ServerXchange fully support binary compatibility? Do we have to modify any applications?

A. ServerXchange is fully compatible with all services that do not require special kernel modules.