



## Caldera Volution Technology White Paper

### Caldera Volution — System Management and Administration Software

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Version 1.5



UNIFYING UNIX WITH LINUX FOR BUSINESS™

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## 1. Executive Overview

Caldera® Volution™ is a complete Linux® management solution that reduces the cost of implementing and managing Linux systems. By enabling secure, remote management of multiple Linux systems through a browser, Volution allows administrators to manage through policies, without having to individually manage each system. Caldera Volution provides the capabilities that administrators need to effectively manage their systems through hardware and software inventory, software distribution, health monitoring, printer configuration and scheduled scripted actions.



Volution makes Linux easier to deploy and manage reducing the total cost of ownership (TCO). It's designed to work with all major Linux distributions including servers and desktops and provides these broad management functions:

- Electronic Software Distribution
- Asset Management
- Health Monitoring
- Printer Configuration Management

## 1.1. Key Features

Some of the key features of Volution include the following:

- **SECURE WEB-BASED MANAGEMENT SYSTEM**
  - Secure administration through any SSL enabled web-browser
  - Ships with a secure Web server
- **ELECTRONIC SOFTWARE DISTRIBUTION**
  - Install and remove RPMs on remote Linux systems that support the RPM standard
- **HARDWARE INVENTORY**
  - Scans and stores the hardware configuration including CPU, memory, disk partitions, network interface card, videocard and more
  - Keeps a history of hardware scans and only saves the changes in hardware (deltas) from the last scan
- **SOFTWARE INVENTORY**
  - Scans and stores installed RPM-based software
  - Keeps a history of software scans and only saves the changes in software (deltas) from the last scan
- **HEALTH MONITORING OF LINUX SYSTEMS**
  - Monitors critical aspects of your Linux systems and provides proactive alerts through SNMP or E-Mail (SMTP) that include:
    - Running applications
    - Number of processes
    - Memory utilization (by bytes or %)

- CPU utilization
- Free disk space checking
- Free memory checking
- Number of users
- LINUX PRINTER CONFIGURATION
  - Configures and synchronizes Linux systems for seamless access to local and network printers
- OTHER FEATURES
  - Supports all major Linux distributions
  - Scheduler/Global Event System that allows actions to be scheduled based on a point in time, repeated time intervals, a local event, or a global event
  - Software and hardware data is searchable, simplifying management and making software distribution easier
  - Logical groups can be created based on searches to simplify software distribution
  - Powerful policy-based management with several configuration and administration options
  - Customizable machine profiling that standardizes and updates applications for each machine (for instance, engineering machine, DNS server, or Web server)
  - Data repository is based on an LDAP V3 directory- the power of LDAP with policy based management making Linux system management much easier

## 1.2. Major Benefits

Some of the benefits of Volution include:

- Multi-language capabilities make Linux manageable on a global basis
- Enhances your current investment in Linux by supporting all major Linux distributions and making each manageable
- Secure Web-based management enables you to securely manage from anywhere

- Reduces the Total Cost of Ownership (TCO) by centralizing management functions, eliminating the need for an on-site technician
- Improves uptime through proactive alerting of troubled systems via SNMP and SMTP
- Supports OpenLDAP, Novell eDirectory and Netscape iPlanet
- Ships with OpenLDAP directory and secure Web server - all ready to use out of the box
- Scheduler/Global Event System enables actions to be taken based on times, repeated intervals, and events. Events-based actions reduce network traffic by eliminating the need for managed systems to constantly poll the server to find out if there are any actions to be taken
- Integrates with Webmin (single-system Web-based configuration management tool authored by Caldera) for real-time analysis and configuration of individual systems
- Downloadable 60 day multi-language evaluation software allows administrators to try before they buy
- Simplifies printing in networked environments
- Flexible policy-based management simplifies day-to-day management functions reducing the overall cost of implementing and managing Linux Systems



## 2. Overview

Caldera Volution is an object oriented management product. "Virtual" objects representing real world objects are stored in an LDAP NDS eDirectory or Netscape iPlanet. Relationships between objects govern the behavior and configuration of the physical systems the objects represent. In Volution, relationships are made by "linking" objects together. Computers that are managed by Volution have a "virtual" computer object. By creating or changing the relationship of objects to the "virtual" computer object, the physical computer's behavior or configuration is changed.

### 2.1. Objects in Volution

The following is a list of objects in Volution that can be linked to computer objects to change the behavior or configuration.

#### 2.1.1 Action Object

This object represents a script that will be executed on all of the linked computers. The action can be scheduled to run at a specific time, a repeating interval, or when a specific event takes place.

#### 2.1.2 Computer Object

A computer object represents a system that is being managed by Volution. It becomes the collection point for asset information (both hardware and software). Changes are affected to a Computer Object through "linking" or association with profiles, actions, and policies.

Computer objects can be linked to other objects in one of three ways.

- 1 Link directly to the computer object. This only affects the individual computer
- 2 Link to a computer group. This affects all computers in the computer group
- 3 Link to a container. This affects all computers in the container

### **2.1.3 Computer Group Object**

Computer groups allow computers to be placed into some logical group. Other objects can be linked to computer groups and this has the same affect as if the object were linked directly to the individual members of that computer group.

### **2.1.4 Profile Object**

Profiles are used to change the software configuration of a managed system. Profiles contain lists of the software to be installed and the software to be uninstalled on a system. Any computer object can be linked to multiple profile objects.

## **2.2. Policy Objects in Volution**

There are several types of policy objects in Volution. Some policies affect the configuration of a machine and others affect the behavior.

### **2.2.1 Printer Policy**

The printer policy represents one entry in a computer's /etc/printcap file. By linking this policy to a computer object, the computer will place the appropriate printcap settings into the computer's /etc/printcap file. Multiple Printer Policies can be linked to a computer to add multiple printer definitions.

### **2.2.2 Gateway Policy**

Volution uses gateways to define where data is accessed and stored. This policy will configure the Volution managed machines to look in certain types of data repositories for information and send logging information to specified targets (SMTP or SNMP)

### **2.2.3 Health Policy**

Volution can monitor the health of a system. This policy configures what Volution will monitor on a system and when to notify system administrators when thresholds are crossed.

## **2.2.4 Inventory Policy**

When software and hardware inventories are run, changes to the systems are detected, and placed in objects called inventory scans. This policy configures how many inventory scans should be kept in the inventory history.

## **2.2.5 Search Policy**

In order to locate all links or relationships between objects, the Volution client must “search” for the relationships. This policy configures how the Volution client will find those relationships. If this policy is not created, a default search policy is hard coded into Volution.

### 3. Caldera Volution Architecture

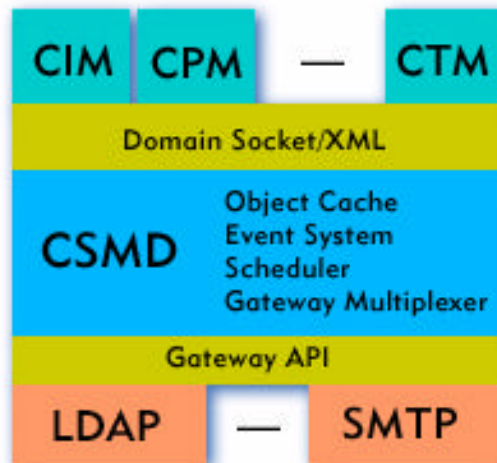
This section will discuss the different components of Caldera Volution and what their purposes are.

#### 3.1. OpenSLP

OpenSLP or Open Service Location Protocol is based on RFCs 2614 and 2808. The purpose of SLP is to provide a standard way for services to advertise themselves and for consumers of the services to find the advertised services. In order to eliminate the need to configure each managed system on which Volution is loaded, OpenSLP was chosen so the software running on a managed system can locate all of the services needed without having to set up or modify any configuration file on the system.

#### 3.2. Volution Client

The Volution Client is the basis for all Volution components to communicate. The client is centered around the CSM Daemon (or CSMD).

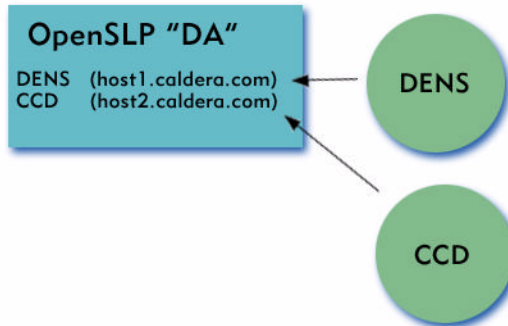


The CSMD is made up of several sub-components which allow it to communicate and interact with all other client components. The most obvious of these inner-components are: Object Cache, Event System, Scheduler, and a Gateway Multiplexer. The details of these sub-components will not be discussed in this paper.

In addition to the CSMD, there exist two other types of components: gateways and modules. Modules are the components that actually perform the work on the managed system. For example, a component named "CIM" for Caldera Inventory Manager is in charge of reading all of the software installed on a system and reporting it back to the CSMD. Modules communicate to CSMD through a domain socket. That communication is done primarily using XML to represent data. The XML is handed off to the Gateway Multiplexer which can in turn hand it to the appropriate gateway. Gateways can interpret XML and fetch data or return data in XML, depending on what is requested. All data handled between gateways and modules is done via XML. Objects that are requested by modules are actually cached in the Object Cache to reduce the amount of traffic needed for any given object. The Object Cache can be updated from any of the gateways via "polling" the gateway or via the Distributed Event Notification System (DENS will be discussed later).

### **3.3. Volution Server**

The Volution Server consists of the Distributed Event Notification System daemon (densd) and the Computer Creation Daemon (csmccd). Both of these modules depend on OpenSLP to advertise their services. OpenSLP holds the location by name in its configuration so that when clients query OpenSLP for a specific service, it can return that information.



### 3.4. DENS

There are two ways Volution managed systems discover changes: polling and pushing. Polling is set up by having an action scheduled to run at a specified interval of time. Systems will run at the scheduled time and make updates only then. This method is useful if you are behind a firewall that cannot let DENS through, or if your managed systems use dialup connections. Pushing is where the Volution server notifies each managed system that there is a change. This notification is done using DENS. After making a change to an object that affects Volution clients, the Volution console allows an administrator to "View", "Submit" or "Cancel" the events. Viewing events will show which DENS event is going to be fired. Submitting events will cause DENS to notify each affected system that a change has occurred. (Note - this does not cause the clients to react. An action must be created to respond to changes.) The notification will cause the Volution clients to then update the "Object Cache," as discussed earlier.

### 3.5. Computer Creation Daemon

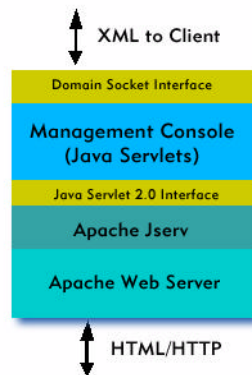
When managing many machines, the problem of getting machines into the Volution management system becomes a problem. The Computer Creation Daemon (CCD) was designed to solve this problem. When the Volution client is loaded on a system, it attempts

to authenticate to the configured LDAP directory. If this is the first time loading, the Volution client will query OpenSLP for the CCD service. The Volution client then contacts the CCD and provides its mac address and name, and the CCD searches the LDAP directory for the appropriate computer object. If the object is found, the password is changed and the computer object is returned to the Volution client with new credentials. If no object is found, a new computer object is created and the new object and credentials are passed back to the Volution client. The Volution client then authenticates to the LDAP directory. Systems that come pre-installed with the Volution client will simply need to be turned on and they become managed.

### 3.5.1 Volution Management Console

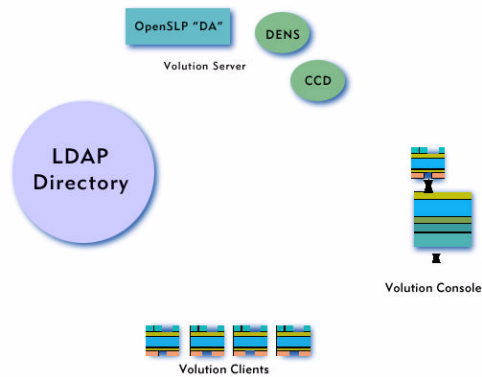
The Volution console is the main interface to Volution, and provides access to modify objects and object relationships.

The console is written to Sun's Java Servlet 2.0 specification. The servlets will run with any servlet engine, although the default when installed is the Apache Web Server with the Apache Jserv servlet engine. The console uses the Volution client to communicate with the LDAP repository, rather than communicating directly. All communication between the console and the Volution client is done via XML.

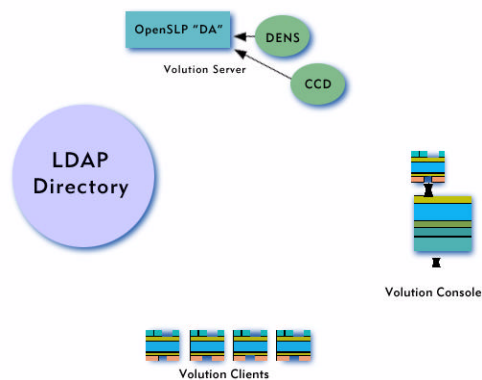


## 4. Caldera Volution In Action

This section will show how all of the components of Caldera Volution interact and the sequence of those events.

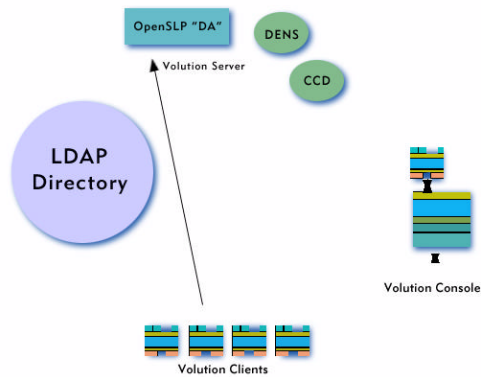


This diagram shows all of the components of Volution. For this discussion, Volution Clients will not be treated individually but as a collective.

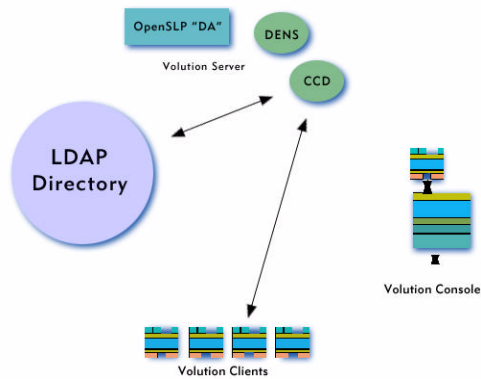


When the Volution Server is first started, both DENS and CCD locate and register with the OpenSLP "DA". This will allow all other components of Volution to find these services.



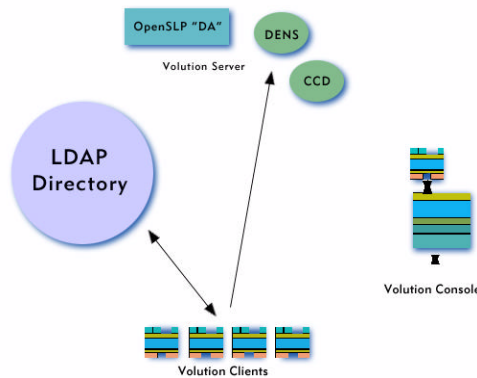


When the Volution Clients are first started, they are not configured to authenticate to the LDAP directory. Because they cannot authenticate, they contact the OpenSLP "DA" in order to locate the Computer Creation Daemon (CCD).

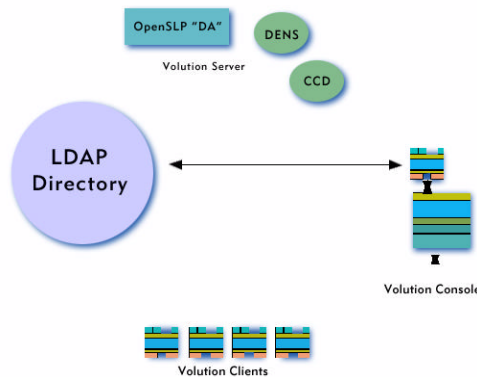


The Volution Clients then contact and pass their MAC Address and hostname to the CCD to acquire credentials to the LDAP directory. The CCD will then search the LDAP directory for computer objects matching the Volution Clients. If the computer objects are found, the passwords are changed and the new computer object and credentials

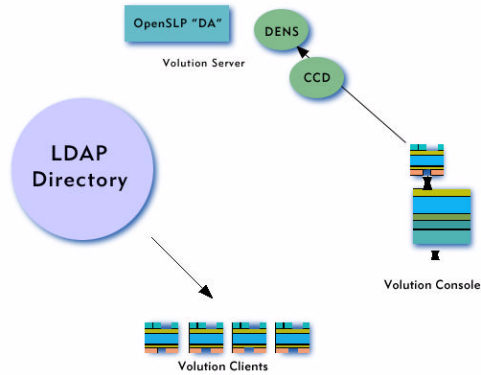
are passed back to the Volution Clients. If no computer objects are found, the CCD will create new computer objects and pass the new computer object and credentials back to the Volution Clients.



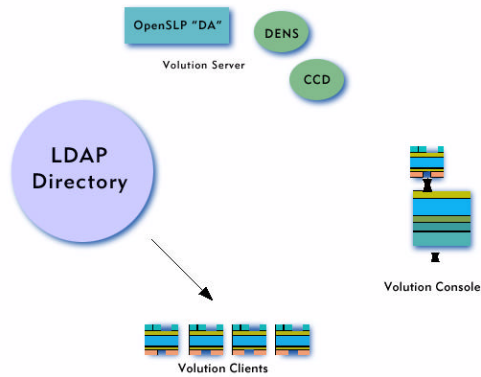
The Volution Clients then authenticate to the LDAP directory. In the LDAP directory the Volution Clients are able to read their configuration settings and perform any needed changes found there. Volution Clients also register with the DENS service (after locating it through OpenSLP) for all objects and event types that affect their configuration. The Volution Client then "sleeps" until it is either notified of a change or an action's schedule becomes valid and something must be performed.



The Volution Console only reforms tasks when someone has connected via a web browser and has authenticated to the LDAP Directory. At that point, any changes that are made in the LDAP Directory are tracked.



If an administrator chooses to "Submit Events", the Volution Console contacts the DENS service (by using OpenSLP) submits the events that have been generated because of the changes made. The DENS service, in turn, notifies each of the Volution Clients that are associated with those events that the events have fired.



The Volution Clients then return to the LDAP directory and read the configuration objects associated with the events that were generated. Only the objects affected by the events are read. The Volution Clients then notify (internally) any modules that may be interested in the changed objects and depending on the configuration and setup inside the LDAP directory, actions may be taken or scheduled to be taken because of the changes.

## APPENDIX 1. Definitions, Abbreviations, and Acronyms

This section includes an alphabetical listing of terms and their definitions, abbreviations, and acronyms that are used in this White Paper.

For a general treatment of terms see "Fundamental Terminology for the Linux Professional," a White Paper by Dean R. Zimmerman. It is available online at this address:

<http://www.caldera.com/company/guides/>

**Caldera Volution** Caldera Volution is a complete Linux management solution that reduces the cost of implementing and managing Linux systems.

**CCD** Computer Creation Daemon. Volution's way of getting machines into the Volution management system.

**CIM** Caldera Inventory Manager is responsible for reading all software installed on a system and reporting it back to the CSMD.

**Container** A container is a directory object that is used to logically group other objects. Containers can contain other containers. For example, a directory tree structure could be as follows: The name of the tree is called Caldera with sub containers of Sales, Marketing, Engineering, Support and Finance. Within each of these containers there are subcontainers called Computers, Users, Applications, and Policies. Within each of those containers are actual directory objects that represent physical devices, applications, users, and so forth.

**CSMD** Caldera Systems Management Daemon.

**DA** Directory Agent. Used with OpenOPENSIP to share information across systems.

**DENS** Distributed Event Notification System. Used to setup Volution to push or pull information to nodes. The default is to push data.

**DHTML** Dynamic HTML enables a Web page to respond to user input without sending requests to the Web server.

**ESD** Electronic Software Distribution, the manner of updating or rebuilding a computer's software inventory remotely, usually through the Internet.

**HTML** Hypertext Markup Language. HTML is a protocol used on the Web to describe document content attributes, similar, though not strictly derivative from SGML.

**HTTP** Hypertext Transfer Protocol is the underlying protocol for defining page layout on the World Wide Web.

**LAN** Local area network, usually based on a client/server mode.

**LDAP** Lightweight Directory Access Protocol allows network nodes to get information from other nodes. A hierarchical method of accessing and managing data with Volusion.

**MAC Address** Media Access Control address, a hardware address that uniquely identifies each node of a network. The hardware address is hard coded onto each network adapter.

**OpenSLP** OpenSLP is an Internet standard protocol (RFC2165) used to discover the existence, location, and configuration of network services. It is not a name resolution service like DNS or NIS. OpenSLP is a product of Caldera Systems, which we contributed to the Open Source community. The function of OpenSLP is discovery, and is implemented in Volusion so Linux Systems that are to be managed can locate the Volusion Server without client-side configuration. Volusion uses OpenSLP to locate services and perform workstation registration.

See <http://openopenslp.sourceforge.net/doc/html/IntroductionToSLP-Index.html> for more info.

**Printcap File** In Linux and UNIX operating system, the printcap file is a configuration table that lists all printers available on the network. Data stored in the printcap file include the name of the printer, the physical device that the printer is attached to, what filter to use, and the settings for other more advanced options.

**Profiles** A collection of software packages that are intended to be installed on or removed from a Linux system. Profiles provide the capability for administrators to run scripts before or after installing or removing software.

**RPM** RPM Package Manager. A standard software distribution format for Linux. Caldera Systems contracted to engage Red Hat to create the package manager to Caldera's specifications. Subsequently, Red Hat released RPM.

**Script** A script is a series of commands written in different formats like Perl, Python, or bash shell that can be executed on a Linux system. They are utilized within Volution in conjunction with actions and profiles. For example, a new version of an application could be distributed through Volution, and a script could accompany the software to unload and load its daemon so the new version would begin running after installation.

**SMTP** Simple Mail Transfer Protocol, a protocol for sending e-mail messages between servers. A method used by Volution for notifying system administrators via e-mail.

**SNMP** Simple Network Management Protocol, a set of protocols for managing complex networks.

**TCO** Total Cost of Ownership. An attempt at isolating all the costs of a particular technology, usually to justify the decision to purchase or not. TCO is a much used concept, but hardly an exact science.

**Volution Agent** The Volution Agent is a small client process that is installed in all Linux Systems that are to be managed. It runs in the background and communicates with the Volution Server and the Data Repository and it initiates actions on the client as prescribed by the administrator.

**Webmin** Webmin is a simple, powerful browser-based interface for system administration. Using any browser that supports tables and forms, Webmin can perform routine system administration tasks such as managing users and groups, adding and deleting software packages, manipulating filesystems, and managing disk quotas. It can also control a wide variety of server programs, such as FTP, Apache,

DHCP, PPP, DNS, and Sendmail. Webmin contains modules for administering network cards, disk partitions, printers, and, of course, for configuring Webmin itself.

**XML** Extensible Markup Language, is a subset of SGML that allows Web designers to create their own tags; thus, enabling the definition, transmission, validation, and interpretation of data between applications and between organizations.



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