

Beyond Interoperability – Solving Customer Problems

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Customers demand solutions, not just functional interoperability. This message has been communicated to the technical world so often that it has become part of everyone's "marketecture" but how often does it go beyond marketing? The primary challenge for most technical companies is to understand what a "solution" is and what portions of the product portfolio can truly help create this solution. Basically, a solution is composed of a set of capabilities, areas of expertise, and methodologies that are applied to a customer's problem.

- Without methodologies, how can the solution provider listen and learn effectively about what the customer's environment is and what problems are affecting it?
- Expertise can now be applied to the problematic aspects of the customer's environment with more focus and with greater confidence that "the right people are working on the right problem." Lack of experience is the last thing that customers want to be exposed to and risk their business on.
- We rely on these experts to be able to apply the right technology to address the specific problem and ensure the solution is effective and applicable beyond the tactical issue it resolves. If the technology lacks certain capabilities or does not fit the problem, then a partnering strategy must be employed to "fill the gaps".

So what does all this have to do with Sun Microsystems' storage interoperability and compatibility with Microsoft computing environments? In a word, "everything".

Sun has recognized that as robust and reliable as its technology is, customers will continue to select products from a diverse set of vendors to meet various business criteria. From specific applications to broadly applied management tools, customer choice is represented in businesses that span from the enterprise to small regional offices and across multiple operating system environments. All of these business-critical applications have a key common denominator, the need for a heterogeneous-enabled, reliable and compatible storage infrastructure. Therefore one of the first steps in providing solutions to customers is the ability to support heterogeneous operating systems and associated applications utilizing a single storage infrastructure. Sun provides this type of heterogeneous operating system support and has made significant progress towards ensuring customers with Sun Solaris™ and Microsoft Windows™ environments can leverage their investment through consolidated, application-aware and robust storage solutions.

Solution Foundations Built on Vendor Qualifications and Certifications

A solution's foundation and credibility is built from basic compatibility tests and resulting certifications and qualifications. Although these types of interoperability tests cannot adhere to every customer environment and unique condition, they are considered to be comprehensive enough to exercise how the operating system should work with the storage infrastructure under ideal conditions. Microsoft has created, and Sun participates in, a variety of storage qualification and certification programs. The official name of the certification program is termed the "Windows Logo Program" and is governed by the Windows Hardware Quality Labs (WHQL), which manages testing conducted by Microsoft as well as the hardware vendor. Successful certifications can span various major versions of the Microsoft Windows operating system, and enables Sun to publicly declare and display the "Designed for Windows" logo. Table 1.0, Operating System List of "Designed for Windows" Certifications for Sun's Storage Portfolio, includes the various Windows operating systems associated with certification of Sun storage.

<i>Windows Operating System</i>	<i>Number of Sun Certified Storage Products</i>
Windows 2003 Standard Edition – 32 Bit	18
Windows 2003 Standard Edition – 64 Bit	5
Windows 2003 Enterprise Edition – 32 Bit	23
Windows 2003 Enterprise Edition – 64 Bit	8
Windows 2003 Data Center Edition	7
Windows 2003 Web Edition	7
Windows 2000 Server	13
Windows 2000 Advanced Server	6
Windows 2000 Professional Server	2

Table 1.0 - Operating System List of “Designed for Windows” Certifications for Sun's Storage Portfolio

Sun has made a commitment to continue to certify its storage products with Microsoft Windows environments. Additional details can be found in Appendix A, Fall 2005, Microsoft Certified Storage Arrays, which depicts the current storage array (“disk”) device certifications and associated Microsoft operating system versions and Appendix B, Fall 2005, Microsoft Certified Tape Storage, which depicts the current tape library and tape drive certifications and associated Microsoft operating system versions.

Sun and Microsoft Solutions

Sun and Microsoft provide our mutual customers a variety of interoperable operating system and storage platform choices. Alone, these choices do not prove to the customer their business application performs optimally. How can our customers be assured they are purchasing the right storage platform for the right operating system for the right application? Through proven solutions.

Sun has significant experience in providing solutions for Enterprise Class customer environments. These environments have very stringent rules with regard to standards compliance, business-driven availability, and investment leverage. As mentioned above, however, the key to each customer solution is the ability to utilize Sun's expertise to match the right technology to the problem. Sun takes this a step further by applying these stringent rules across the storage platform portfolio. A general classification of these rules can include:

- **Reliability** – enables the solution to perform optimally over a given, lab-verified, period of time. The period of time and conditions associated with Sun's testing is based upon industry accepted standards like those required by the telecommunications industry's, Network Equipment-Building Systems (NEBS), which include testing under various extreme environments (electrical interference, climatic variations, and physical handling, to name a few). In addition, Sun also adheres to standards required by the U.S. Department of Defence like the Military Specification, MIL-Spec 810F, which include ruggedization tests based upon shock and vibration.
- **Availability** – enables the solution to remain operating even when certain components fail (like power supplies and disk drives). Sun includes redundant components in most of its storage products (customers do have the option to exclude redundant components for cost

considerations). In addition, Sun adheres to industry accepted, de-facto standards that enable a customer's business-critical data to remain available and resist corruption through various levels of Redundant Array of Independent Disks (RAID). RAID levels can range from 0 to 6 and provide increasing levels of fault tolerance and performance improvements.

- **Scaleability** – enables a customer to leverage their investment by adding and expanding the storage infrastructure without drastic upgrades, like interrupting services while an older piece of equipment is removed and a newer one is added. Sun and Microsoft provide certified configurations that allow additional servers and storage devices to be added to existing environments in what are termed clusters without interrupting existing services and without drastic upgrades. Clusters provide our mutual customers a way to distribute work loads and storage capacity while providing higher availability and performance.

The previous rule classifications provide the context for the storage solutions that are described below. In each case, support for these rules will be highlighted.

Case Study #1 – Enhanced Data Protection, Data Availability and Disaster Recovery for Windows Environments

Customer Problem

Customers face several different problems associated with their data protection infrastructure: shrinking backup windows, real-time data set copies that enable business analysis without corrupting production information, and test environment modeling for performing near real-world testing, to name a few. These problems are compounded by:

- the ever increasing amount of data and number of data consumers/producers
- the need to support multiple versions of software and resultant data sets
- the need to provide all of these capabilities and still track what information is stored, who has access, and logs capturing any transactions
- the need to adhere to business requirements for reliability, high availability, scalability and disaster recovery

Notice these requirements have little or no dependency on the specific application, operating system, and storage infrastructure. The requirement represents a true need for heterogeneous solutions. Sun's solution provides this type of heterogeneous, business-critical capability.

Sun's Data Management Solution

Whether it is called Information Lifecycle Management (ILM) or Hierarchical Storage Management (HSM), Sun has focused on providing solutions that alleviate customer's data management problems and are reliable, available scalable and also cost effective. The Content Infrastructure System (CIS) is a “Customer Ready System” that is composed of hardware and software components which are pre-configured and pre-tested according to the quality of service requirements associated with the customer's data.

CIS is a multi-tiered archival and data management infrastructure that provides customers a way to manage massive amounts of data in an affordable manner through the use of data management policies and tiered storage components. The tiered storage components vary in terms of cost and performance and are intended to provide the “right technology for the right problem”, as exemplified in Figure 1.0, Medium CIS Configuration Example. There are three tiers:

- Working Data Set – fast, online access using Fibre-channel arrays (e.g. StorEdge (SE)3510)
- First Archive Level – info. retrieved from archive within seconds using SATA array (e.g. SE3511)
- Second Archive Level – info. retrieved from archive within minutes using LTO2 tape device (tape)

The archival/policy management system is provided through the server-resident, SAM-FS software.

Sun Content Infrastructure Platform - Medium Configuration

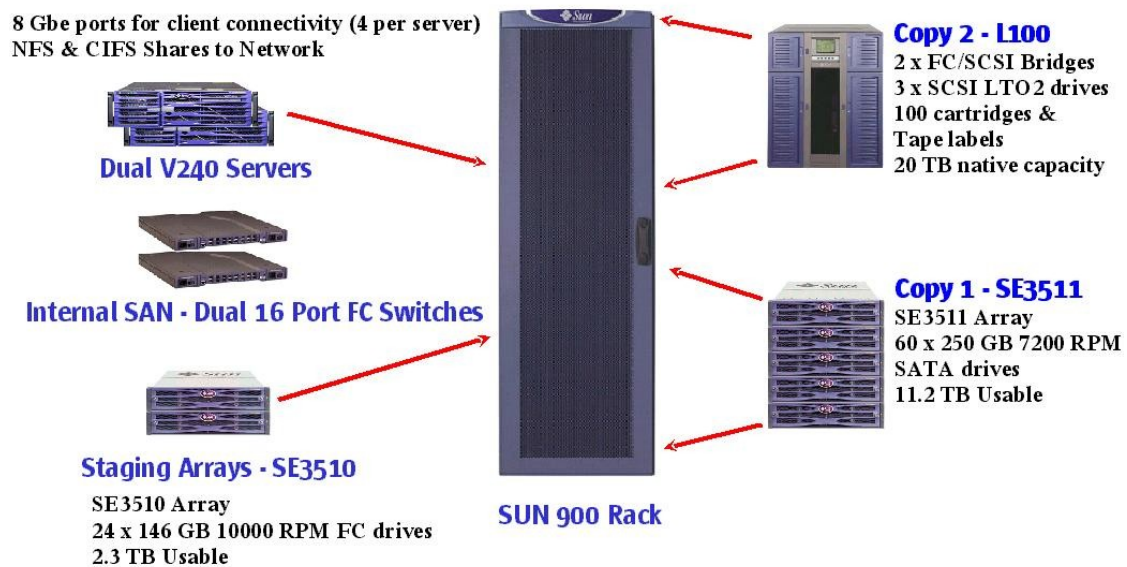


Figure 1.0 – Medium CIS Configuration Example

Microsoft Windows Applicability

There is no emphasis on the application and operating system in the description above; implying that this Customer Ready System can be applied to many different application and operating system environments.

Windows applicability is provided directly through communication with the file system itself using an agent resident on the application server. The CIFS communication protocol is used to provide the conduit between the agent and the Solaris-resident “listener”. The application data is copied using the agent, a secure communication socket is used to pass the information from the agent to the listener, and the listener “puts” the data in the SAM-FS file system. Windows' user access and file-level security is maintained through the native Windows Access Control List (ACL). Each user has the ability to self-serve restore files from archival through a graphical user interface available in the Windows environment.

Once the initial copy is made, the CIS environment will use customer-selected time intervals to “sweep” through the file system and determine if a new file exists or an existing one has been modified. If true, the file will go through the copy sequence and be managed by the availability requirements the customer has specified through the SAM-FS policy engine. The key to cost savings is the mechanism that automatically removes files that have not been accessed or modified within the customer selected time interval. The files are not deleted, they are simply moved to less expensive storage and eventually to tape for long-term archival. Every file and location is logged in case the customer should choose to retrieve the information.

Solution Summary

This solution assists customers with their problems in the following ways:

- **Shrinking Backup Windows** – a copy of the file is created only when changes are made, typical backup operations copy the entire file system.
- **Business Analysis and Near Real-Time Testing** – multiple copies (up to four) can be streamed to other storage targets simultaneously, eliminating any extra steps, efforts, and potential corruption.
- **Increasing Data and Users** – only frequently accessed data is kept in online arrays, other data is streamed to storage targets according to data management policies. User level security is maintained.
- **Adhering to Business Requirements for Reliability, High Availability, Scalability and Disaster Recovery** – the CIS infrastructure provides all capabilities for all of these business critical requirements.

Case Study #2 – Archive and Compliance Management for MSFT Exchange Environments

Customer Problem

Email has become a business critical application. It can:

- Be addressed to multiple people with multiple attachments, simultaneously
- Become an involved “conversation” and expand indefinitely
- Exist in a central server or client system for many years
- Provide a record identifying business and personal information

Interestingly enough, every one of the examples above can cause quite a number of issues for today's corporations. A short list of problems that customers can face, include:

- Keeping track of who has received what information (is the information confidential?)
- Increasing amounts of information to be retained without real business value associated with it
- Information can exist anywhere, can be sent to anyone, be resident on any personal computer, and duplicated across the corporate enterprise and beyond
- The resulting environment forces companies to “throw” more people and computing resources at the problem since each user, and their uncontrolled data growth, forces less and less users to be resident per server and increases management complexity

Add governance and regulation compliance to the mix, and the resultant costs become immeasurable as a corporation attempts to search, retrieve and verify the integrity of business record communications.

Sun's e-Mail Compliance and Content Management Solution

Data management regulations driven by IT Governance and Government-defined compliance requirements number in the tens of thousands across the globe; solution flexibility and heterogeneous

support are not options. Due to the sensitivity and potential liability associated with regulation violations, corporations cannot afford to partner with solution providers that lack an end-to-end capability, lack world-wide and world-class support organizations, or lack the expertise and experience implementing business-critical solutions. Sun embodies this type of credibility.

The Sun Compliance and Content Management Solution (C²MS) provides a fully automated, heterogeneous, archival, retrieval and discovery solution that helps address regulatory compliance, corporate governance and litigation support requirements. It provides this capability while lowering overall operational, administrative and storage infrastructure costs for Sun customers. C²MS can:

- automate enforcement of records retention policies and mandates
- enhance a customer's ability to address state, federal and international regulatory requirements
- facilitate implementation of corporate governance policies and compliance programs
- automate archiving, searching and retrieving data records
- lower the total cost of ownership through server, storage, administration and management consolidation

Architecture description and where email applies

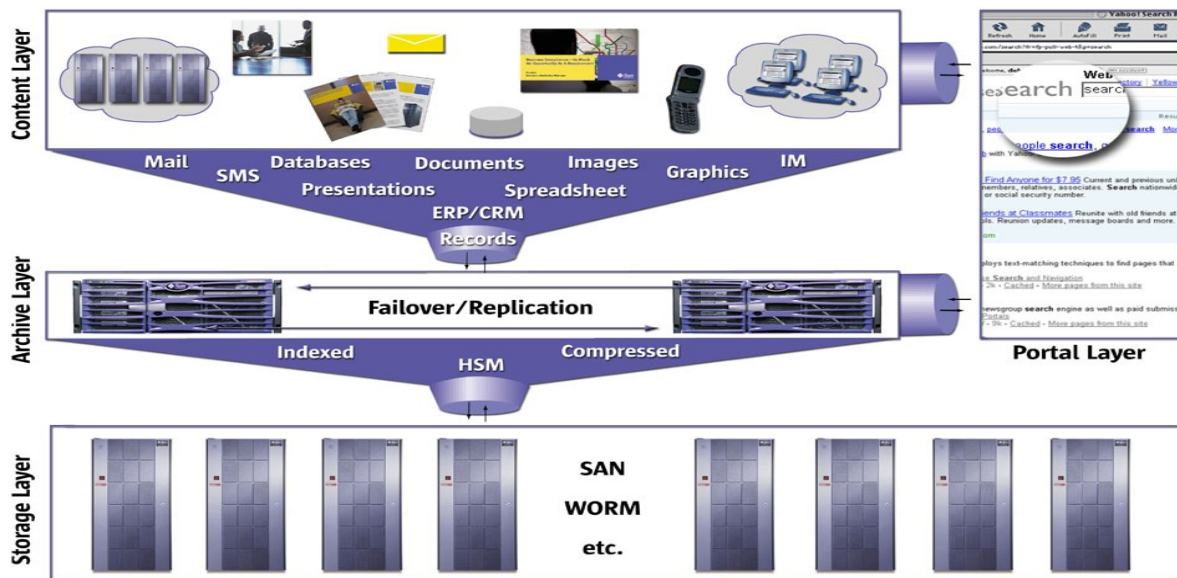


Figure 2.0 – C²MS Architecture Overview

In essence, C²MS is easy to use, integrates seamlessly into customers' existing email infrastructures, can be implemented incrementally and retains the reliability, availability and scalability that customers have come to expect from Sun. Figure 2.0, C²MS Architecture Overview, exemplifies a very critical feature – this solution can apply to multiple data types and content, not just email!

Microsoft Exchange Applicability

Like users of many other email packages, users of Microsoft's Exchange system face a variety of common problems:

- messages are difficult to find and retrieve
- mailboxes have size limitations
- information is lost when an email record is inadvertently or prematurely deleted

In addition, many corporations exhibit some or all of the following challenges:

- poor capacity management and performance
- high infrastructure and administrative costs and complexity
- potential legal risks due to compliance and legal discovery requirements
- hidden costs for litigation and retrieval support

C²MS addresses these problems with a combination of hardware and software components. A key characteristic that many customers demand is the solution not add to the complexity of the current environment. In addition, the need to leverage the existing infrastructure and skill sets is required. This is accomplished by adding the C²MS solution into existing Microsoft Exchange environments. Table 2.0, Sample Medium C²MS Configuration represents the components of the system; notice that the CIS architecture described above in the first case study is flexible enough to be used for this solution architecture.

C ² MS Version	Configuration Type	AXS-One Archive Version	Lotus / MSX Server Version	OS	Archive Server	Portal Server	Attached Storage Combinations
3.0	Medium Level	3.0	Lotus R5, R6 MSX 5.5, 2K, 2003	Solaris 2.8, 2.9, 2.10 (Archive) Windows 2000/2003 (Portal)	1 * Sun V1280 4CPU	1 * SunFire V40z 4CPU (Large Config)	Sun 5550 Content Infrastructure System (CIS) Part @MS-Large-P + @MS-SATA-1 30TB Tape, 30TB Disk

Table 2.0 – Sample Medium C²MS Configuration

Solution Summary

C²MS supports the following business requirements:

- The directing of Government or commercial policies and standards towards the management of data
- Ensuring that the policies are correctly applied to the customers data and that compliance is met
- Providing an easy-to-administer policy and compliance platform that will meet the requirements of corporate governance and governmental regulations
- Ensuring that internal business governances are met to achieve business goals, meet performance SLAs and that generally support the strategic goals determined and internally legislated by a business

C²MS manages the following type of Microsoft Exchange data:

- eMail
- Attachments
- Exchange Objects
- Public Folders
- PST Files

C²MS:

- helps address customer's regulatory compliance, corporate governance, and legal discovery/litigation support requirements
- handles all types of electronic records that must be retained, managed, retrieved and purged based on corporate policies
- reduces costs associated with administrative tasks, server infrastructure and storage
- improves operational efficiencies while reducing risk with a complete end-to-end solution
- creates and enforces automated policy-based access and archiving processes in a heterogeneous environment
- rapidly retrieves transparently migrated records
- manages infrastructure and users via centralized administration

APPENDIX A – Fall 2005, Microsoft Certified Sun Storage Arrays

The following products have been certified with various Microsoft Windows operating system versions. For the latest information, please go to <https://www.sun.com/cgi-bin/contactme-form.cgi> and fill in the appropriate fields; a Sun representative will contact you concerning your question.

System	Std-32	Std-64	Ent-32	Ent-64	D-Center	Web	2k	2kAdv	2kProf	2kD-Center
SE9990	Yes	No	Yes	No	No	No	Yes	No	No	No
SE9985	Yes	No	Yes	No	No	No	Yes	No	No	No
SE9980	Yes	No	Yes	No	No	No	Yes	No	No	No
SE9970	Yes	No	Yes	No	No	No	Yes	No	No	No
SE6920	Yes	No	Yes	No	No	Yes	Yes	Yes	No	No
SE6320	No	No	Yes	No	No	No	No	Yes	No	No
SE6130	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No
SE6120	No	No	Yes	No	No	No	No	No	No	No
SG-XPCI2FC-EM2	Yes	No	Yes	No	No	No	No	No	No	No
SG-XPCI2FC-QF2	No	No	Yes	No	No	No	Yes	No	No	No
SG-XPCI2FC-LM320	No	No	Yes	No	No	No	Yes	No	Yes	No
SE3511	No	No	Yes	No	No	No	No	No	No	No
SE3510	Yes	No	Yes	Yes	No	No	No	No	No	No
SE3320	No	No	Yes	No	No	No	No	No	No	No
SE3310	Yes	No	Yes	No	No	Yes	Yes	No	No	No
FLX V2X	Yes	No	Yes	No	No	No	Yes	No	No	No
FLX 280	Yes	No	No	Yes	No	No	Yes	Yes	No	No
FLX 240	No	Yes	No	No	No	No	No	No	No	No

KEY

SE - Sun StorEdge Arrays

SG – Host Bus Adapters

FLX – STK FlexLine Arrays

APPENDIX B – Fall 2005, Microsoft Certified Sun Tape Storage

The following products have been certified with various Microsoft Windows operating system versions. For the latest information, please refer to For the latest information, please go to <https://www.sun.com/cgi-bin/contactme-form.cgi> and fill in the appropriate fields; a Sun representative will contact you concerning your question.

System	Std-32	Std-64	Ent-32	Ent-64	D-Center	Web	2k	2kAdv	2kProf	2kD-Center
L700	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
L180	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
L80	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
L40	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
L20	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
T9940	Yes	No	Yes	No	Yes	No	Yes	Yes	No	No
T9840	Yes	No	Yes	No	Yes	No	Yes	Yes	No	No

KEY

LXXX – Tape Storage Libraries

TXXXX – Tape Storage Drives