

Novell and Microsoft: Building Bridges

October 2008

Executive Summary

On November 2, 2006, Microsoft and Novell announced a series of interoperability agreements to jointly build, market and seamlessly support new solutions designed to make Microsoft and Novell products work better together. The goal is to bridge the worlds of proprietary and open source technology based on a foundation of mutual respect for intellectual property.

The original agreement focused on four technical areas that would enable better interoperability between Windows® and Linux® platforms: virtualization, systems management, directory and identity management, and document format compatibility. Since then, Microsoft and Novell have added cooperative agreements on Linux management packs for Microsoft® System Center, Accessible Computing and Moonlight®, a Linux implementation of the Microsoft® Silverlight™ browser plug-in. These technologies provide solutions for customers so they can reduce costs in their data centers, gain new levels of flexibility and streamline operations—all with complete peace of mind around licensing and integration. This white paper provides an inside look at the technical collaboration between the two companies and the customer solutions that they drive.

Introduction

Since the 2006 joint agreements, Microsoft and Novell have worked closely to help solve interoperability challenges for customers. Recognizing that a majority of organizations today are running more than one operating system, Microsoft and Novell help customers continue to realize the unprecedented choice and flexibility of running a mix of Windows and Linux as primary platforms in the data center.

Too often IT professionals must develop work arounds to connect disparate systems within their heterogeneous environments. With multiple operating systems, separate management tools, different skill set requirements and the limitations of data sharing as defined by workloads, the results can lead to underutilized server resources, poor infrastructure management, inefficient workflows and higher maintenance costs.

To address these customer challenges, Microsoft and Novell agreed to collaborate on a number of technical projects to improve operational efficiency in the data center. The companies first sought common ground on intellectual property. Then they developed a multi-year partnership for work pertaining to engineering and standards in the areas of virtualization, systems management, federated identity and document format interoperability. Microsoft and Novell established an interoperability lab in Cambridge, Massachusetts, for testing and developing these solutions, and a joint sales and marketing team to promote and sell the solutions. Since the partnership was announced in 2006, the two companies have engaged in three new areas of engineering: Moonlight, a Silverlight plug-in for Linux; User Interface (UI) Accessibility; and enterprise Linux management packs.

The goal of these projects is to give customers greater confidence that their Windows and SUSE Linux Enterprise systems will work better together, provide intellectual property (IP) peace of mind, and bridge the gap between proprietary and open source software. The collaboration between the two companies has set a precedent for how the industry should approach customer interoperability challenges.

This white paper describes the technical collaboration between Microsoft and Novell and highlights key milestones that have been achieved since the partnership was announced. With a keen focus on customer challenges, the companies continue to develop solutions that integrate easily and that help customers streamline operations, reduce data center costs and support flexibility.

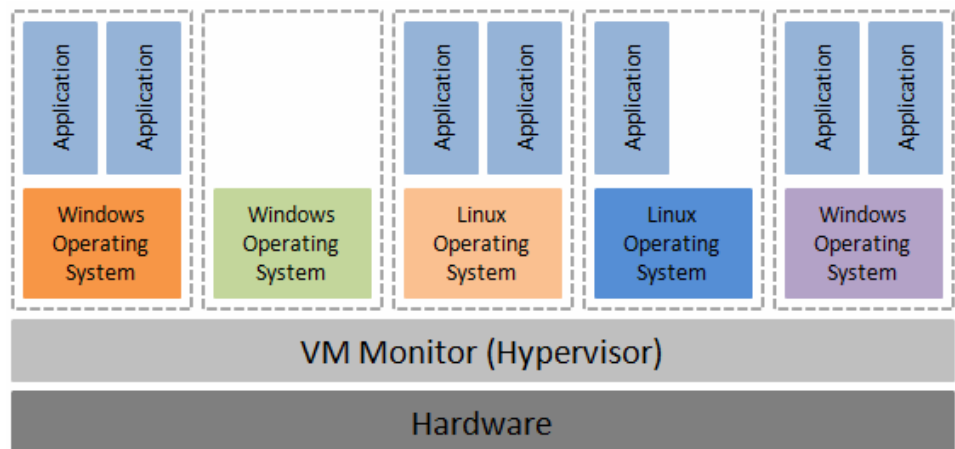
"They said it could not be done. This is a new model and a true evolution of our relationship that we think customers will immediately find compelling because it delivers practical value by bringing two of their most important platform investments closer together."

Steve Ballmer
CEO, Microsoft

Virtualization

Virtualization decouples software from hardware. This technology enables multiple operating systems to run simultaneously on a single machine, combining workloads and reducing physical server sprawl. One of the first technical areas that Microsoft and Novell have focused on to enable better interoperability is virtualization, which can be implemented using two primary methods: full virtualization and paravirtualization, or enlightenment. Using full virtualization, hardware or software—or a combination of both—emulates a full platform to support an unmodified operating system. Although full virtualization was a popular method in the past, it was difficult for virtual machines to share information between other virtual guests and the host system. More recently, virtualization platforms are moving toward a hypervisor architecture such as Xen and Windows Server® 2008 Hyper-V™. With a hypervisor platform, a thin layer of software sits between the physical server and the operating system layer to broker I/O, networking, SMP processor utilization and other hardware service requests. Guest operating systems are modified through enlightenment or paravirtualization, a process that makes the guest operating system aware of the hypervisor layer on which it runs. This new architecture is fundamentally more secure and provides the foundation for improved performance and resource optimization between virtual guest systems.

Figure 1: Hypervisor-based virtualization. Virtual machines are enabled by a Virtual Machine Monitor (hypervisor) layer that sits between the operating system (OS) and hardware. This layer mediates access to hardware resources and permits multiple OS instances to coexist on a single server.



Customer Benefits of Virtualization

The majority of organizations today are running more than one operating system, with many using both Windows and Linux, making virtualization an important trend in the data center. Armed with virtual machines, data center administrators can create new levels of flexibility and agility in their environments by improving resource utilization on physical servers, thus increasing the total return on those investments. Virtualization also provides business continuity by supporting the ability

to move workloads from one physical machine to another. Moreover, virtualization provides efficiencies in system utilization, application portability and server management, transforming disparate racks of compute and storage servers into a powerful, effective enterprise platform.

Microsoft and Novell Virtualization Solutions

Through a cooperative effort, Microsoft and Novell have worked closely to create a virtualization solution that allows customers to run both Linux and Windows workloads side by side on a common virtualization platform with integrated management and support. As customers look to maximize their IT resources in mixed source environments, Microsoft and Novell are responding by providing solutions that offer a wide range of flexible options.

“Microsoft and Novell are enabling customers to take advantage of each other’s products where it makes sense in their enterprise infrastructure. We jointly believe that our business and patent agreements make it possible to offer the highest level of interoperability with the assurance that both our companies stand behind these solutions.”

Ron Hovsepian
CEO, Novell

- **Microsoft Windows Server 2008 Hyper-V.** The next-generation, hypervisor-based server virtualization technology, Hyper-V, allows you to best use your server hardware investments by consolidating multiple server roles as separate virtual machines (VMs) running on a single physical machine. With Hyper-V, you can efficiently run multiple operating systems—Windows, Linux and others—in parallel, on a single server, and fully leverage the power of x64 [bit] computing.
- **Xen from Novell.** SUSE Linux Enterprise Server 10 includes the popular Xen hypervisor and offers virtualization capabilities unmatched by those in other Linux operating systems. Out of the box, it can create Xen virtual machines that run modified, highly tuned, paravirtualized guest operating systems for optimal performance. SUSE Linux Enterprise Server 10 is the first Linux operating system to be tuned for the Xen hypervisor.

Innovation through Partnership—Joint Virtualization Solutions

As a solution to the growing need for heterogeneous virtualization, Microsoft and Novell have jointly delivered virtual machine adapters that translate the hypervisor calls between Windows Server with Hyper-V and SUSE Linux Enterprise with Xen operating systems.

Enlightened SUSE Linux Enterprise Server 10 on Microsoft Windows Server 2008 with Hyper-V

When the Xen-enabled SUSE Linux Enterprise Server 10 guest runs on Hyper-V, it uses the native Xen hypercalls to access virtualization functions. The adapters function as a software translation layer, adapting the Xen hypercalls into Hyper-V

hypercalls, so that the SUSE Linux Enterprise Server 10 guest can run with optimized performance as an enlightened guest. These adapters are available through the Linux Integration Components, which provide synthetic device driver support for network, storage and input devices for virtual Linux operating systems. The Linux Integration Components install the hypercall adapter for the Xen-enabled Linux kernel to provide the translation layer between Microsoft and Xen hypercalls. These components can be downloaded at <http://connect.microsoft.com>

Paravirtualized Windows Server 2008 on SUSE Linux Enterprise Server 10 with Xen Technology

The work between Novell and Microsoft has also resulted in the ability to host Windows Server 2008 on Xen hypervisor technology while taking advantage of the Windows Server 2008 paravirtualization to boost performance. SUSE Linux Enterprise Server 10 is the first enterprise platform to include a fully integrated and supported version of the Xen 3.2 hypervisor, the emerging open source standard for virtualization services. With the Xen code and management tools that ship as part of SUSE Linux Enterprise Server 10, organizations can run multiple operating systems on the same physical server with minimal performance impact. As a result, they can significantly increase server utilization, reduce server sprawl and lower costs.

Similar to the adapter developed to host SUSE Linux Enterprise Server on Hyper-V, Novell has developed a translation layer that maps the Hyper-V hypercalls from the Windows Server 2008 guest to Xen hypercalls. An I/O adapter similarly maps the infrastructure for hosting front-end drivers written to the Hyper-V environment to run on a Xen-based platform. This allows the Xen hypervisor in SUSE Linux Enterprise Server 10 to host a paravirtualized deployment of Windows Server 2008. As a member of the Server Virtualization Validation Program (SVVP), Novell has produced hypervisors that are validated by the program to provide optimal interoperability for customers.

Virtualization Management

Data center automation solutions from Novell and Microsoft manage compute and storage servers on behalf of applications or services hosted in virtual machines.

Microsoft System Center Virtual Machine Manager

Microsoft System Center Virtual Machine Manager is a stand-alone server application that manages virtualized data centers running Windows Server 2008 with Hyper-V technology. Virtual Machine Manager is tightly integrated with other System Center products, and together they provide comprehensive management of

physical and virtual environments. Virtual Machine Manager can also centrally manage Linux guests. Organizations can use it to:

- Deploy Linux VMs in VHD format from the central library
- Configure the virtual machine parameters for Linux VMs, such as RAM and disk space
- Control the state of the virtual machine (start/stop, pause/resume and save/restore)
- Live migrate a running Linux VM from one physical host to another

Virtual Machine Manager provides IT professionals with a simple and cost-effective solution for consolidating underutilized physical servers to virtual machines. In addition, it enables rapid provisioning of new virtual servers, centralizes management, and takes advantage of standard hardware and file-level storage.

Novell Data Center Management Solutions

The “brain” of Novell data center management is Novell ZENworks® Orchestrator. It allows for policy-based automation across heterogeneous environments. ZENworks Orchestrator takes a heuristic approach, continually learning from previous events and resource demands.

Virtual machine management is critical to efficiently implementing virtualization in the data center and achieving a solid return on investment. Novell ZENworks Virtual Machine Management provides the following heterogeneous virtual machine management capabilities:

- Provides lifecycle management of VMware, Xen and Microsoft virtual machines
- Discovers offline and online virtual machines and servers for virtual machine commissioning
- Provides deployment, redeployment and rollback of virtual machines
- Manages physical, virtual and storage compute nodes
- Features cluster-aware virtualization
- Includes policy-based dynamic workload deployment

Heterogeneous Systems Management

As part of a wide-ranging commitment to improve functionality and simplify IT, Microsoft and Novell are working together for greater consistencies around

standards-based management solutions for Linux and Windows environments. The two companies have collaborated to develop compatible implementations of WS-Management (WS-Man) protocols in both Linux and Windows as well as within their respective management products. These protocols enable customers to use Microsoft System Center and Novell® ZENworks® products to manage mixed Windows and Linux operating system-based solutions.

Furthermore, Microsoft and Novell are collaborating on a set of Linux management providers based on the Distributed Management Task Force (DMTF) Common Information Model (CIM). These providers will support the Open Group OpenPegasus project's Common Information Model Object Manager (CIMOM) and WS-Management. This work will give customers greater freedom, broader reach and better interoperability from their management applications using common protocols to manage heterogeneous environments.

The enhancements that both Microsoft and Novell contribute back to the open source community will increase the manageability and interoperability of Linux and Windows systems. Aligned support for standards like WS-Management from Novell and Microsoft, as well other hardware and software vendors, helps accelerate the integration of standards based management infrastructure upon which the whole industry can build. These standards help management solutions efficiently gather information and drive transactions needed by system administrators to establish consistent and reliable management operations.

By driving and implementing open standards, Novell and Microsoft are reducing the complexity of managing mixed Windows/Linux environments. Customers and partners will have better access to the information they need to make management decisions and keep IT operations streamlined.

Directory and Identity Federation

Microsoft and Novell are working together to simplify directory and identity interoperability. The two companies have partnered to create federation relationships between the Windows® Active Directory® directory service and the Novell® eDirectory® service using the WS-Federation specification. Microsoft implements WS-Federation in Active Directory Federation Services (ADFS), and Novell implements WS-Federation in Novell Access Manager. The collaboration between Microsoft and Novell around federation standards means that authorized users can seamlessly access Web-based services with one set of passwords and policies, whether their user accounts principally reside in Novell eDirectory or Active Directory.

For smart-client applications, Microsoft and Novell are implementing an even more sophisticated form of interoperable identity management that takes advantage of the desktop computer's ability to remember the relationships a user has with identity providers. These relationships are modeled as electronic Information Cards and provide an easy way for Web applications and services to validate user identity, making signing in and signing up much easier for users.

The Microsoft Information Card implementation is called Windows CardSpace and is delivered as part of Microsoft® .NET Framework 3.0, which is built into the Windows Vista® operating system. As a result of the collaboration agreement between Novell and Microsoft, Novell has developed an open source implementation of an identity selector for Linux called DigitalMe, a set of components that enables users and applications to interact with Windows CardSpace-compatible Web sites and services. By using a Windows CardSpace-aware Web browser such as Firefox with the DigitalMe extension installed, users can easily provide the required information by selecting an appropriate Information Card from the set of cards that they own.

In addition to incorporating this open source identity selector with Novell Access Manager, Novell is providing reference implementations that will be submitted to the open source community. DigitalMe is being managed by the Bandit open source project (<http://www.bandit-project.org>) and can be downloaded for SUSE® Linux Enterprise Server 10 from Novell and several other Linux implementations at http://www.bandit-project.org/index.php/Digital_Me.

Document Compatibility

Microsoft, Novell and the open source community are collaborating to ensure smooth, transparent interoperability between Microsoft® Office and OpenOffice.org documents. Two of the most common data formats for business productivity software are Open XML Formats, used by Microsoft Office and OpenDocument Format (ODF), used by OpenOffice.org. Users want to be able to work with files created in either format, regardless of the software they use.

Figure 2:
As a result of our
collaboration, end users
can more easily share
files between Microsoft
Office and
OpenOffice.org.

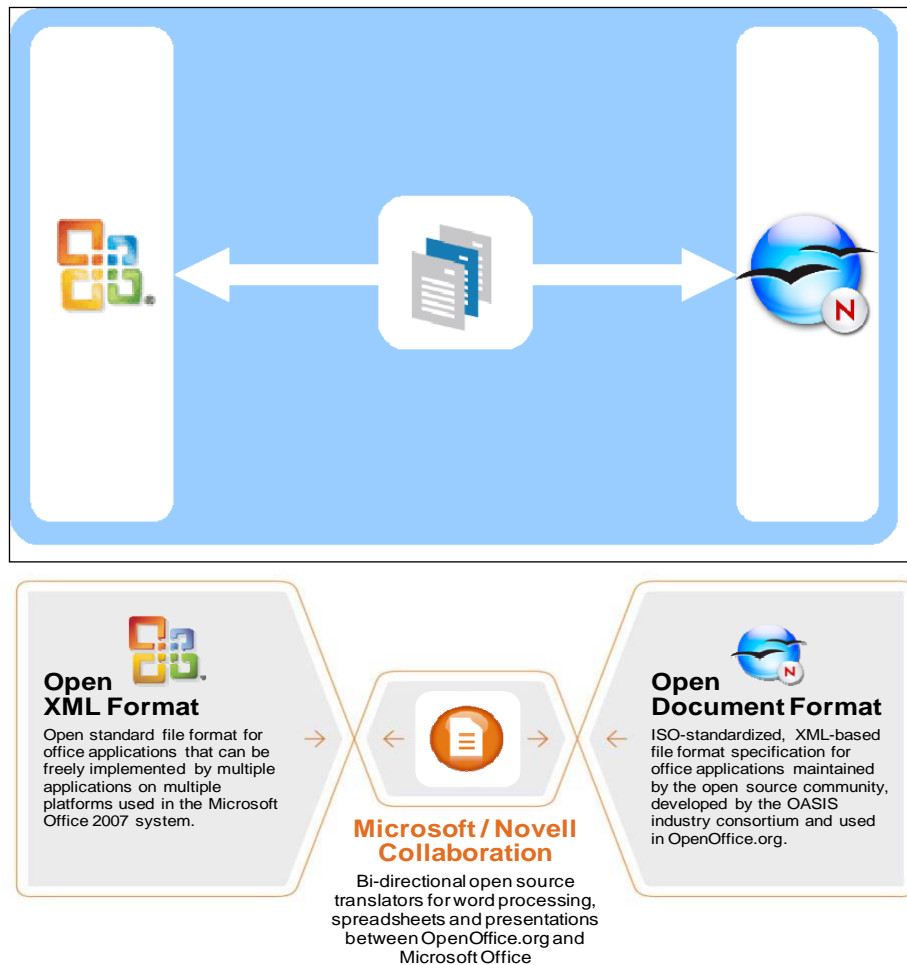


Figure 2

OpenXML

Open XML is the default file format for Microsoft Office 2007. Microsoft also makes the Open XML format widely available, offering free updates to customers with earlier versions of Microsoft Office. The Open XML format is an open standard file format for office applications that can be freely implemented by multiple applications on multiple platforms. The Open XML format was proposed by Microsoft and developed and completed by the Ecma International organization's technical committee, TC45. The Ecma General Assembly approved it as a standard on December 7, 2006. In March 2008, the Office Open XML file formats received the necessary number of votes for approval as an ISO/IEC International Standard.

OpenDocument Format

OpenOffice.org is a full-featured, open source office productivity suite with word processing, spreadsheet, presentation, and database applications. OpenOffice.org currently supports the OpenDocument (ODF) file format, which is an ISO-standardized, XML-based file format specification for office applications maintained by the open source community. The OpenDocument format ensures information saved in spreadsheets, documents and presentations is freely accessible to any OpenDocument-supporting application. OpenOffice.org is available for free at: <http://www.openoffice.org>. Novell provides and supports OpenOffice.org for both Linux and Windows as part of its SUSE Linux Enterprise Desktop and Novell Open Workgroup Suite offerings, respectively.

Open XML Format and Open Document Format Translators

With support from Microsoft, the open source community has provided interoperability between Open XML and ODF through the Open XML/ODF Translator Add-in for Office. This translator makes it possible for files—including word processing documents, spreadsheets and presentations—created in one format to be opened and saved in the other.

When the translator is used with Microsoft Office XP, Office 2003 or the 2007 Office system, users can open ODF files in their Microsoft Office programs. The translator can conversely be used to open Open XML documents with other business productivity software that uses ODF as the default format. In addition, the translator can be used in other domain-specific scenarios and applications, such as back-office batch document conversion and centralized file transformation services.

The first release of the translator, in January 2007, provided file format translation capability between word processing programs, enabling users to open ODF documents in Microsoft Office Word 2007, and Open XML documents in programs using OpenOffice.org as the default format. The second release added file format interoperability between spreadsheet and presentation programs. The translators were developed and licensed as open source software and made available as free, downloadable add-ins for the 2003 and 2007 releases of the Microsoft Office system on SourceForge.net (<http://www.sourceforge.net/projects/odf-converter>)

In its first year of availability, the translator was consistently among the 25 most active projects on Source Forge and was downloaded more than 1.5 million times, demonstrating the strength of market interest in translator technology to achieve interoperability. The translator is available in English, Chinese, German, French, Japanese, Dutch and Polish.

Developers creating programs using Open XML or ODF as the default file format can integrate the translator into their products and enable their users to open and save files in either format. For example, Novell makes the translator available with its version of OpenOffice.org 2.4 Novell Edition for the SUSE® Linux Enterprise platform (available at <http://www.novell.com/products/desktop/features>), enabling OpenOffice.org users to open and save documents in both Windows and Linux operating system environments using Open XML. Additionally, Novell plans to release the 2.0 version of the ODF Translator in September 2008.

The translator illustrates how proprietary and open source software organizations can work together to meet the needs of customers. This project also demonstrates how Open XML and ODF can coexist as open standards in commercial products to provide more choice to enterprises, governments, consumers and developers.

- **Enterprises and governments** can now support multiple document file formats. Document format compatibility gives organizations the choice of a wider range of programs for any file-related need, such as document creation, management and archiving. Organizations also gain the flexibility to add programs to their existing systems based on which programs best meet their specific needs.
- **Consumers** can use the translator to work with files from their employers, their friends or the Internet, without concern for which file format is native to the programs they use.
- **Developers** can create solutions in the file format of their choice—or create solutions that support both formats—and know that their solutions can be used by the broadest possible market. Find more information at <http://sourceforge.net/projects/odf-converter>

Accessible Computing

Microsoft and Novell are working together to make it easier for software companies and developers to create and deliver assistive technologies across both Windows and Linux platforms, which will improve access to computer technology for people with disabilities. The joint work between Microsoft and Novell in this area, which is in collaboration with the Accessibility Interoperability Alliance, will:

- Enable User Interface Automation (UIA) to interoperate with the Linux accessibility frameworks, which ship with SUSE Linux Enterprise, Red Hat and Ubuntu Linux

- Ensure interoperability of non-visual access to the next-generation software applications
- Complement investments made by the industry
- Be open

Moonlight

With more applications moving to the Web, developers are eager for new ways to make Web content stand out so people take notice. To support these needs, Microsoft introduced the Microsoft Silverlight browser plug-in. The cross-browser Silverlight plug-in provides enhanced audio and video streaming and playback over the Web using Windows Media® technologies and allows developers to integrate data and services in rich and unique ways. Silverlight also gives developers and designers new options for delivering great experiences that span the Web, PCs, phones and other devices.

When Microsoft introduced Silverlight in September 2007, the plug-in was available for the Windows operating system and Apple Macintosh platforms. However, customers immediately asked for a version of Silverlight that they could run on Linux-based computers.

Microsoft worked with Novell to create an open source implementation of Silverlight called Moonlight®. For the Linux environment, Moonlight will deliver the same rich media capabilities currently available for the Windows and Apple environments.

Moonlight is designed to run on major Linux distributions and will support the Firefox Web browser. It will also support both the JavaScript programming model available in Silverlight 1.0, as well as the full Microsoft .NET programming model enabled in Silverlight 2. Moonlight will be available as a free download from Novell, including a Moonlight 1 release to support viewing Silverlight 1.0 content and a Moonlight 2 release to support Silverlight 2 content.

Developers and designers can use Microsoft Visual Studio® and Microsoft Expression® to develop Silverlight programs, and those programs will run automatically on Linux using Moonlight. Simply speaking, Moonlight brings Linux users a way to consume Silverlight content being created for the Web.

Moonlight will give users of Linux-based systems access to world-class Web experiences that incorporate video, animation, interactivity, and stunning user interfaces. Developers gain new tools for differentiating and enhancing their Web applications without increasing development costs.

For users—enhanced high-definition Web experiences:

- Custom-branded Web experiences using 2D vector graphics, animation, styling and skinning
- Highly sophisticated rich interactive applications across major browsers on Mac, Windows, Linux and devices
- High-definition video and advanced streaming techniques for world-class media experiences
- Unparalleled interactivity with high-resolution content through Deep Zoom technology

For developers—compelling cross-platform development platform:

- One development effort can address all Windows, Mac and Linux-based Web users
- Reduced development and deployment costs
- Stunning vector-based graphics, media, text, and animation and overlays that enable seamless integration of graphics and effects into any existing Web application
- Cost-effective media delivery using the Windows Server operating system
- Thriving ecosystem of .NET and Windows Media-focused partner, developers and applications

A Customer-Centered Future

In summary, the 2006 announcement of the Novell and Microsoft agreement to jointly build, market and seamlessly support new solutions to make Microsoft and Novell products work better together has produced major advances in cross-platform interoperability. Since forging the five-year agreement, the two companies have rolled out six interoperability initiatives and a joint interoperability lab where new interoperability technologies are tested. Our mutual customers have benefited from the results as they reduce data center costs, gain new levels of flexibility, and streamline operations—all with complete peace of mind around licensing and integration. More information on the collaboration between Novell and Microsoft is available at:

- <http://moreinterop.com>
- <http://www.novell.com/linux/microsoft>
- <http://www.microsoft.com/interop/msnovellcollab>

References

Building Bridges

<http://moreinterop.com>

SUSE Linux Enterprise Virtualization

<http://www.novell.com/linux/virtualization>

Microsoft Virtualization

<http://www.microsoft.com/virtualization/solution-tech-server.mspx>

<http://www.microsoft.com/windowsserversystem/virtualserver/default.mspx>

Microsoft Moonlight

<http://www.go-mono.com/moonlight>

Novell Systems Management

<http://www.novell.com/dca>

Novell Identity Management

<http://www.novell.com/identity>

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