Novell's New Open-Door Policy

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The most often-quoted words in U.S. President John F. Kennedy's 1961 inaugural address are "Ask not what your country can do for you-ask what you can do for your country." Kennedy's words invoke a sense of national identity—a sense of oneness with the vast collection of people that comprise the United States. However, the spirit of these words can also apply to smaller collections of individuals, such as the individuals that comprise a particular community.

More and more, IT companies are demonstrating the spirit of these words by asking what they can do for their community. For example, these companies have recently begun to ask how they can contribute to the open-source community—a community that many IT professionals regard as important to the health of the IT community itself.

The goal of the open-source community is to promote the widespread use of, and contributions to, open-source software—software for which the source code is freely available. According to supporters, open-source software serves the health of the IT community at large by providing programs that are, among other things, more stable and less costly to develop than closed-source programs. Open-source software is also likely to be standards-based, which increases the likelihood that open-source programs will be interoperable.

As you probably already know, Novell is among the IT companies that publicly support open-source software and other community-minded goals, such as open standards. Novell has acted on its commitment to open standards by making its acclaimed NDS eDirectory Lightweight Directory Access Protocol (LDAP) compliant and by adding TCP/IP support for its equally acclaimed NetWare operating system.

Novell is also demonstrating its actions-speak-louder-than-words philosophy with the Novell LDAP Libraries for C software developer kit (SDK). The LDAP Libraries for C SDK is based on the C libraries from the OpenLDAP Foundation's OpenLDAP Project—an open-source project to provide LDAP software, including a standalone server, applications that access that server, and development tools. (You can download the Novell Libraries for C SDK at http://developer.novell.com/ndk/cldap.htm. For more information about the OpenLDAP project, visit http://www.openldap.org.)

With the LDAP Libraries for C SDK, Novell is contributing to the open-source community by contributing bug fixes and enhancements to the OpenLDAP C libraries upon which the LDAP Libraries for C SDK is based. Developers can use the LDAP Libraries for C SDK on NetWare 5 (or above) and 32-bit Windows to write applications that access NDS eDirectory and other LDAP-compliant directories. (In the future, Novell will also release the LDAP Libraries for C SDK for the Solaris platform.) Like national goals that are worthy of support, some community goals arguably advance the best interests of the individuals and organizations that comprise that community, and the goals of the open-source software community are no exception. Novell's commitment to the open-source community, and its participation in that community, have the potential to benefit Novell, you, your company, and the open-source community. To help you understand these benefits, this article contains a summary of the activities of the open-source community and explains what Novell is doing to contribute to that community.

Illustration: Jessica Chen

FREEDOM TO DIFFER

Like any other community, the open-source community is composed of smaller groups, each of which has a slightly different point of view. Many individuals who comprise the open-source community associate themselves with one of the following groups:

- The Free Software Foundation (FSF)
- The Open Source Initiative (OSI)

Although the FSF and the OSI both promote open-source software and community involvement in the development of that software, the FSF and the OSI have significant ideological differences. (However, despite these differences, FSF and OSI members usually cooperate with one another.) These differences hinge on the question of software property rights.

Specifically, the FSF believes that software should not be proprietary. (For more information about this belief, see "Why Software Should Not Have Owners" at http://www.fsf.org/philosophy/why-free.html.) The OSI, on the other hand, believes that software may be proprietary, but software owners may often find it advantageous to open the source code for their software to others. (For more information about the differences between FSF and OSI, see "More or Less Open" on pg. 24.)

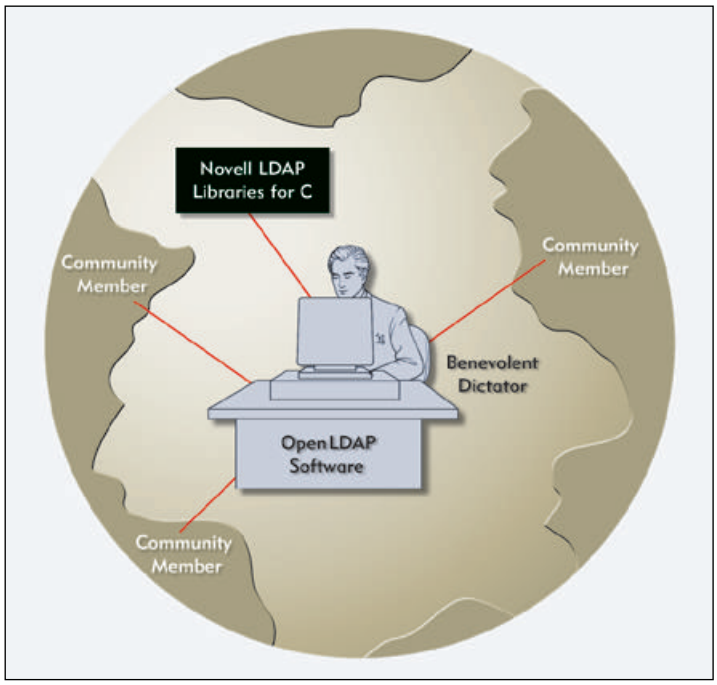

Figure 1. The benevolent dictator is the person who ultimately determines which contributions will be included in the project code.

A LICENSE TO SHARE

The ideological differences between the FSF and the OSI are reflected in the licenses under which FSF- and OSI-approved software is developed. The FSF favors a license agreement called a *copyleft*, or GNU's Not Unix (GNU) General Public License (GPL), agreement, which makes software free according to the FSF definition. In other words, the copyleft agreement ensures a user's right to copy, change, and distribute software licensed under this agreement.

Under the copyleft agreement, changed software can be distributed. However, if this changed software is distributed, it must be distributed under a copyleft agreement. For example, if a user modifies a copyleft application to use code from a copyrighted application, the resulting application is covered under the copyleft agreement. In other words, the copyleft agreement effectively prohibits software vendors from combining free (open source) software with nonfree software. (For more information about the copyleft agreement, visit http://www.fsf.org/copyleft/gpl.html.)

This prohibition can be equally effective at dampening a software vendor's interest in contributing to the development of software licensed under a copyleft agreement. For example, suppose a software vendor is interested in contributing to copyleft code that could, say, enhance one of its copyrighted applications. Although that software vendor may gladly give the bug fixes and modifications it makes to the copyleft code back to the open source community, this vendor may be understandably hesitant to make its own, copyrighted code public. (However, Raymond makes a business case for doing just that in "The Magic Cauldron." To download this paper, visit http://www.tuxedo.org/~esr/writings/magic-cauldron/magic-cauldron.html.)

OSI-approved licensing agreements are based on the OSI's less restrictive definition of open-source software. As a result, OSI-approved licenses are often less restrictive than FSF-approved licenses. The most important difference between OSI-approved licensing agreements and FSF copyleft agreements is this: Modified software can be distributed under the same OSI license as the original software but isn't required to be.

In addition, OSI-approved licenses cannot "contaminate" other software licenses. In other words, the OSI's definition of open-source software allows businesses to combine open source software with nonopen source software under OSI-approved licenses.

The flexibility of the OSI definition naturally results in a variety of open-source licenses. For example, the list of OSI-certified licenses includes both the restrictive FSF copyleft agreement and the less restrictive OpenLDAP Public License—the license under which Novell is developing its LDAP Libraries for C SDK. (To view a list of OSI-certified licenses, visit http://www.opensource.org/licenses.)

Among other things, the OpenLDAP Public License does not require users to contribute modified code back to the originator of that code, as many open-source licenses do. In addition, OpenLDAP 2.0 software will be released under an updated license that the OpenLDAP Foundation has revised to remove all significant restrictions.

Predictably, most of the IT businesses that want to contribute to the open-source community make those contributions through OSI-certified licenses that are less restrictive than the copyleft agreement. For example, Novell plans to initiate future open-source projects under its Novell Cooperative License (NCL), which is presently undergoing the OSI certification process. (To view "Novell Cooperative License," visit the NetWare Connection web site at http://www.nwconnection.com.)

However, not all IT businesses make contributions to the open-source community through these less restrictive licenses. For example, RedHat Inc. and Caldera Systems Inc. are literally in the business of contributing to and distributing open-source software—the Linux operating system—that is licensed under the copyleft agreement. In addition, Netscape released the source code for its Communicator 5.0 browser under a version of the FSF copyleft agreement.

ASK WHAT YOU CAN DO FOR YOUR COMMUNITY

Given that IT businesses are out to earn a profit and the OSI—like the FSF—is a nonprofit organization, you may ask why the OSI encourages business participation and why businesses want to participate. The answer to both questions is simple: The open-source community benefits from business involvement because that involvement increases both the amount of open-source software and the number of people contributing to that software. Furthermore, businesses benefit because they can then use open-source code—which is known for its rapid development and stability—to enhance their products.

The open-source community benefits because the more source code that is available, the greater the odds that a particular member of the community will find a project that meets his or her interests or needs. In addition, the source code from one open-source project can spark ideas for other open-source projects—ideas that may not

More or Less Open

Members of the open-source community often associate themselves with one of two open-source organizations: the Free Software Foundation (FSF) or the Open Source Initiative (OSI). Although both of these groups promote open-source software, in philosophical terms, they are quite different from one another. Following is a historical view of these differences.

Richard Stallman, FSF president, and some of his colleagues established the FSF in 1985 to provide funding for the GNU's Not Unix (GNU) project. The goal of the GNU project is to create a complete open-source, Unix-like operating system. The impetus behind the GNU project was Stallman's negative reaction to a nondisclosure agreement that effectively prohibited him from sharing programming information with his colleagues. (For more information, see "The GNU Project" at http://www.fsf.org/gnu/the-gnu-project.html.)

The "Free" in the FSF's name does not refer to the asking price of software but rather to the conditions under which software is distributed. By the FSF's definition, free software can be sold. In fact, the FSF derives much of its income from the free software it sells.

After a user purchases free software, however, he or she is free to copy and distribute it—for a fee or not. The user is also free to change free software and to then distribute the changed versions—also for a fee or not. (The FSF semantically prefers the term free software to open software. For more information, see "Why 'Free Software' is better than 'Open Source'" at http://www.fsf.org/philosophy/free-software-for-freedom.html.)

As you may expect, given the impetus behind the GNU project and the FSF definition of free software, the FSF objects to the commonly accepted business practice of copyrighting software. In fact, the FSF objects to this practice on moral grounds. Copyrights that prohibit software users from copying, sharing, and changing software are, according to the FSF, antisocial, unethical, and "simply wrong." (See "The GNU Project.")

Not surprisingly, most businesses interpret the FSF point of view on copyrighting software as something of a "keep out" sign. Consequently, until 1998, business participation in the open-source community was negligible.

HOW BAZAAR, HOW BAZAAR

Recognizing that the open-source community was suffering from lack of business participation, Bruce Perens, Eric Raymond, and other interested parties established the OSI in 1998 to promote open-source software "on pragmatic grounds of reliability, cost, and strategic business risk." Perens became OSI treasurer, and Raymond became OSI president. (For more information, see "OSI Launch Announcement" at http://www.opensource.org/press_releases/osi-launch.html.)

Raymond's 1997 paper, "The Cathedral and the Bazaar," captures the OSI's ideas of how the open-source community should operate. In this seminal paper, Raymond explains both the process and the advantages of developing open-source software under the "bazaar" method.

The bazaar method is a development process that is, among other things, "open to the point of promiscuity." ("The Cathedral and the Bazaar," Chapter 1, p. 1. To download this paper, visit http://www.tuxedo.org/~esr/writings/cathedral-bazaar.) That is, everyone who wants to contribute to this process—no matter what the agenda or approach of the contributor—is allowed to do so. (According to Raymond, the development process of the Linux operating system is quintessentially the bazaar method.)

In contrast, the cathedral method of development exemplified by Stallman's development of Emacs depends on the expertise of "individual wizards or small bands of mages working in splendid isolation." ("The Cathedral and the Bazaar," Chapter 1, p. 1.)

According to Raymond, his paper inspired Netscape Communications Corp. to release the source code for its Communicator 5.0 browser. (For more information about Netscape's announcement, visit http://www.netscape.com/newsref/pr/newsrelease558.html.) Since the bazaar method does not discourage business participation in the open-source development process, you shouldn't be surprised that Netscape developed Communicator 5.0 as a bazaar-style project.

Netscape's January 1998 announcement inspired several members of the open-source community, including Raymond, to find a way to promote the advantages of open-source software to businesses on the "same pragmatic, business-case grounds that motivated Netscape." Among other things, these grounds include rapid development and a high degree of stability. (See "History of the Open Source Initiative" at http://www.opensource.org/history.html.)

After being launched in 1998, the OSI recognized that the FSF definition of free software doesn't exactly extend a welcome mat to businesses. As a result, the OSI replaced the term free software with the term open-source software and gave this term a more business-friendly definition.

have occurred to the original developer of that code.

In addition, the more people testing open-source software, the more likely that bugs within the code will be discovered and fixed. "There's one quote I really like," explains Dave Gardner, an NDS product manager for Novell. "Eric Raymond calls this Linus's law: 'Given enough eyeballs, all bugs are shallow.'" (See "The Cathedral and the Bazaar," Chapter 4, p. 2. To download this paper, visit http://www.tuxedo.org/~esr/writings/cathedral-bazaar.)

Linus's law—named for Linus Torvalds, the creator of the Linux operating system—works in part because different users are bound to run open-source code in different environments, and bugs that don't show up in one environment may show up in another. For example, Novell is moving the OpenLDAP code upon which it is basing the Libraries for C SDK to different platforms.

"We move the code to different platforms or try it in different environments, and when we find things to fix, we send those fixes back," Gardner says.

Businesses also help make open-source software more accessible to users. Users criticize open-source software because it is not user friendly. That is, open-source software can be difficult to install and sometimes lacks features—such as a GUI—that would make it easy to use and manage.

Although the open-source community, which is comprised largely of programmers, often neglects user features that businesses refer to as "fit and fin-

ish," businesses within the open-source community are generally less likely to neglect these features. In particular, Novell plans to apply the same amount of attention to the fit and finish aspects of its open-source software—beginning with the LDAP Libraries for C SDK—that it applies to all Novell products.

"One of the big wins about Novell participating in open source is that we know how to do high-quality fit and finish software," explains Kris Magnusson, the open-source architect for Novell. "We're going to be doing a lot of stuff with fit and finish that I think the open-source community will really like, because the fit and finish needs to be there."

For example, Novell has incorporated OpenLDAP software for creating C programs that access LDAP directories into a single, easy-to-use SDK. Novell plans to build additional fit and finish aspects into future open-source releases.

WIDE, OPEN SPACES

How can Novell and other businesses balance the interests of the open-source community in which they participate with their own business interests? The answer to this question depends on the participating business. Novell and other businesses will undoubtedly try to balance open-source interests and the interests of their users and stockholders.

"Novell wants to be a good open-source community citizen," Gardner states. According to Gardner, good citizenship requires, among other things, that citizens understand how open-source development works.

To begin with, open-source citizens like Novell should understand that someone is ultimately responsible for the code that comprises a given project. That person, in open-source jargon, is "the benevolent dictator," or the person who determines which contributions will be included in the project code and which will not. (See Figure 1 on p. 22.)

For example, the benevolent dictator for the OpenLDAP Project is Kurt Zeilenga, the chief architect of the OpenLDAP Project. (OpenLDAP software is based on the work of the defunct University of Michigan LDAP project. The OpenLDAP Project is currently enhancing this work to support LDAP v3.) That is, Zeilenga is responsible for determining which of Novell's contributions will be included in OpenLDAP software.

Novell and other open-source community members can develop code for OpenLDAP in three ways:

- They can find and fix bugs.
- They can create enhancements.
- They can develop new features or extensions.

Squash a Bug

When a community member finds a bug in OpenLDAP software, he or she reports the bug by submitting a bug report to the OpenLDAP Issue Tracking System. Other community members can then find out about new bugs and help find fixes for them. (For information about current bugs in the OpenLDAP project, visit http://www.openldap.org/its and click on Software Bugs.) If a community member develops a fix for a bug, he or she can—but is not required to—submit that fix.

"We encourage people to contribute back to the community, but we don't require it," Zeilenga explains. "OpenLDAP is a community-based project which relies on a cooperative development model, and cooperation must be voluntary." However, Zeilenga adds that vendors have compelling business reasons to cooperate in the development of LDAP infrastructures. That is, cooperation helps create a better infrastructure upon which to build LDAP-compliant directories and client applications. Needless to say, "Novell has volunteered to contribute back changes," Zeilenga concludes.

When Zeilenga receives bug fixes, he either accepts or rejects those fixes on the basis of their effectiveness and then makes accepted bug fixes available through new releases of OpenLDAP software.

Make It Better, Step-by-Step

Novell and other community members can also create enhancements to OpenLDAP software. For example, a community member can port the software to an operating system that it does not support. "Novell is moving the software to different platforms and testing it on them, and when we find things to fix, we send those fixes back, "Gardner explains. "We have

interest in platforms such as NetWare and Windows and Linux."

By testing the LDAP Libraries for C SDK on these platforms, Novell can help increase the total number of platforms upon which OpenLDAP software runs efficiently. Of course, the entire open-source community benefits from this.

Novell and its developers also benefit because the LDAP Libraries for C SDK runs efficiently on the platforms these developers are most likely to use. Novell can also receive fixes and enhancements from those developers, which, in turn, may contribute to the usefulness and stability of the LDAP Libraries for C SDK.

Extend the Capabilities

The LDAP Libraries for C SDK and the OpenLDAP software upon which it is based are compliant with LDAP v3, which means that community members can also create extensions to that software. LDAP v3 includes controls and extensions. Controls allow you to modify existing operations such as the Search operation. Extensions allow you to create new operations. (For more information about LDAP v3, see "LDAP and NDS: A Relationship You Can Count On," *NetWare Connection*, Nov. 1999. You can download this article from http://www.nwconnection.com/past.)

"One of the big wins about Novell participating in open source is that we know how to do high-quality fit and finish software," explains Kris Magnusson.

"Novell will be adding extensions over time," Gardner asserts. Which of these extensions and enhancements will ultimately become part of the OpenLDAP software? That depends on which extensions and enhancements ultimately meet the goal of the OpenLDAP Project: to provide the infrastructure necessary to deploy LDAP in the real world.

As previously mentioned, this infrastructure consists of a complete implementation of LDAP, including the standalone server, the access applications, and the development tools. OpenLDAP development tools include the OpenLDAP C Libraries and some command-line tools for implementing directory-enabled applications.

"OpenLDAP's primary goal is to develop a robust implementation of LDAP standards," Zeilenga explains. "However, a secondary goal is to provide a reference implementation of LDAP standards." A reference implementation is an implementation to which vendors can refer when they want to know how they can implement LDAP specifications properly.

In keeping with the goal of the OpenLDAP Project, Zeilenga will accept Novell enhancements that are useful in terms of

the project's reference implementation, such as enhanced support for the Windows NT port in the LDAP Libraries for C SDK. Furthermore, Zeilenga will accept Novell extensions that are standards-track or generally useful.

"Standards are a real key to us," Zeilenga explains. "If a Novell extension isn't published as a standards-track or informational RFC [Request for Comments], we will encourage Novell to publish the RFC. Open implementations require open specifications."

Whether or not Novell publishes a standards-track RFC for a given extension depends (again) on how generally useful that extension is. For example, if Novell creates an extension that applies only to NDS eDirectory—Novell's LDAP-compliant directory—Novell may publish only an informational RFC for that extension.

"I also chair the SDK working group for the Directory Interoperability Forum [DIF]," Gardner explains. "And one of the things I've been telling those folks is this: If you come up with an interesting concept, the first thing you want to do is figure out if you're the only one that's interested. If you are, then you may have an internal thing. If other companies are interested, then you may have a candidate for a standard." (DIF is an organization for directory vendors that are working to provide directory interoperability through LDAP and other standards. For more information about DIF, see the "What's the DIF" section of "NDS and LDAP: A Relationship You Can Count On," or visit http://www.directoryforum.org.)

For example, Novell is working on extensions that provide ways of controlling the NDS eDirectory replication operation—such as Add Replica, Delete Replica, and Merge Replica extensions. "These extensions are specific to NDS eDirectory," Magnusson explains. "We're not sure the community really cares about them because other directories—Netscape Directory Server, for example—don't operate in the same way."

However, if an extension or control is interesting to more than one entity, Novell and other DIF members will work with the Internet Engineering Task Force (IETF) to publish an RFC to make that control or extension an LDAP standard. For example, the IETF is currently working on an Internet Draft that describes an LDAP control called *server-side sort*. Server-side sort extends the capabilities of the LDAP Search operation to allow search results to be sorted on the server before those results are presented to client applications, which would otherwise need to do the sorting. (For more information about LDAP standardization, visit http://www.ietf.org.)

"You can imagine that when somebody comes up with a good idea like server-side sort, everybody's going to say 'that would be nice to have,'" Gardner asserts. According to Gardner, ideas like server-side sort are the ideas Novell will work to get on the IETF standards track.

GO AHEAD: ASK WHAT YOUR COMMUNITY CAN DO FOR YOU

As mentioned earlier, Novell benefits from participating in the open-source community by receiving access to the highly stable and innovative code that results from the open-source process. Novell also plans to benefit from the open-source community by initiating open-source projects that address missing pieces in the Internet's infrastructure. "There's a lot of missing infrastructure on the Internet right now," Magnusson explains. "Craig Burton calls it the Dark Ages of the Internet because there are so many missing pieces." (Craig Burton is the founder of the Burton Group, an IT research and advisory firm. For more information about the Burton Group, visit http://www.burtongroup.com.)

For example, the Internet needs a public key infrastructure. "If I'm writing an application and want somebody's public key, I can't just connect on a port the way I can with LDAP and say 'Where's the public key?'" Magnusson states. Since one of Novell's key strategies is the development of Internet-based services—called Net Services—Novell and its customers will obviously benefit from projects that address these missing pieces of Internet infrastructure.

Novell also plans to reap benefits by developing other types of open-source projects that tie in to its overall strategy. For example, Novell would benefit if there were an open-source mechanism by which people could connect to the Net Services Novell creates.

"People will have to have some sort of a connector to use Net Services," Magnusson observes. "So developing open-source connectors makes a lot of sense." In fact, NDS eDirectory is a Net Service, and the LDAP Libraries for C SDK is a means by which people can connect to that service.

The Novell Libraries for C SDK is integrated with the Novell Developer Kit (NDK). Developers can use this SDK, including Novell extensions that may not be interesting to the community at large, to write programs that access LDAP directories in general and NDS eDirectory in particular.

"If developers want to deploy their applications with NDS eDirectory, then they'll probably want to support Novell extensions, such as replica management and partitioning. We're basically giving them the option to do that rather than jamming those extensions down the throats of the LDAP community," Magnusson explains. "The Novell extensions are like icing on the cake. The cake's still pretty good; it's just more icing."

Useful URLs

If you are interested in using or developing open-source software, you should check out the following web sites:

- **http://www.oreilly.com/catalog/opensources/book/toc.html.** This URL connects you to *Open Sources: Voices from the Open Source Revolution*, an online book that contains essays from leaders in the open-source community. The book is U.S. $24.95 in hard copy and free online.
- **http://sourceXchange.com, http://www.cosource.com, and http://www.openavenue.com.** If you moonlight as an open-source developer, you should take advantage of these web sites, which offer open-source marketplaces for selling open-source software.
- **http://www.razor.bindview.com.** At this web site, you can download the Zombie Zapper free. This open-source software can thwart would-be denial-of-service attacks on your company's web site.

As Novell initiates open-source projects, it will place the source code for those projects in an open-source repository. If you are among the increasing number of network administrators who develop in-house applications, you will then be able to use that source code to write those applications. You will also be able to alter that code to suit your company's particular needs. Furthermore, you can contribute your altered code back to the open-source community.

"We can not only say come play, but come contribute," Gardner says. "It's an invitation to develop along with us." (For more information about developing open-source code, see "Useful URLs" on p. 30.)

CONCLUSION

For proof of open-source software's value to the IT community at large, you don't have to look any farther than the Internet. Open-source software—such as TCP/IP and Berkeley Internet Name Daemon (BIND)—dominates the Internet. "There are only a couple of TCP/IP stacks and pretty much everybody looks at everybody else's, so you could pretty much say there's only one TCP/IP stack," Magnusson explains. "It's the same with BIND."

DID YOU KNOW?

Rear Admiral Grace Murray Hopper, a renowned mathematician and programmer, coined the computing term *bug* in 1946 when she identified the cause of an error in the Mark II computer she was working on: It was a moth, which happened to be trapped in a relay.

Why is open-source software so ubiquitous on the Internet? One possible answer is that the Internet is based on open standards, and so (largely) is open-source software, which makes open-source software a natural candidate for Internet-based applications. With its commitment to the LDAP Libraries for C SDK, Novell is acknowledging this natural connection.

At the same time, Novell is recognizing the importance of directories for accessing and controlling Internet-based applications and services, such as e-commerce services. By choosing the LDAP Libraries for C SDK as its first open-source commitment, Novell is underscoring its position on the future of directories on the Internet and also its commitment to a standards-based way of accessing those directories.

"Top to bottom, the LDAP Libraries for C SDK is really a strike for freedom," Magnusson concludes. "I don't want to sound too revolutionary here, but we're really helping people move off of proprietary directory access APIs like Microsoft's access mechanisms. We're saying 'here's an alternative.'"

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