**Cloud Computing: What CIOs Need to Know About Integration**

When combining cloud computing services with internal systems, confusion reigns. The reasons: lack of standards, concerns about availability and the potential for vendor lock-in.

By [Kim S. Nash](http://www.cio.com/author/127852/Kim+S.+Nash) **on Sat, May 15, 2010**

Cloud computing promises the ability to move applications and systems to the location and platform that makes the most sense—in terms of risk and economics—at any given time.

Retailers, for example, can buy extra transaction-processing capacity during holiday shopping season and give it up when sales ebb. Financial services companies might buy infrastructure in which to test systems to support new products, then walk away from it when development is done. One cloud vendor may offer a better deal than another, prompting CIOs to switch providers.

And as cloud computing evolves, some corporate IT systems will continue to reside in your data center, some perhaps with outsourcers and others with one or more cloud vendors. You will have to manage it all as though it were one computing environment, without controlling it all. "Your data center doesn't define your IT environment anymore," says Judith Hurwitz, president of the consultancy Hurwitz and Associates and author of *Cloud Computing for Dummies*. This, she says, makes integration "the most important issue in the cloud."

Yet there are no standards for integrating cloud computing systems. XML may be the simplest way to move data from one Web-based system to another, but many CIOs venturing into the cloud will have to connect Web and non-Web systems, and do so in a mix of cloud and on-premise environments. It's a challenge on par with efforts a decade ago to connect back-end legacy systems with Web-based user-facing applications.

Veterans of those days, as well as of more recent software-as-a-service (SaaS) deployments, know something of the integration challenges cloud computing will bring: experimenting with different application programming interfaces for speed and fluidity, avoiding lock-in to a cloud vendor's proprietary application programming interfaces (APIs), and a whole lot of testing. But there are some twists that CIOs should know how to identify and address, such as connecting Web applications to niche or legacy systems without built-in support for virtualized servers and choosing from among the nascent cloud-interoperability specifications vying for dominance. What's more, the vendors emerging as big players, such as Amazon and Google ([GOOG](http://finance.cio.com/idg.cio/quote?Symbol=GOOG)), lack experience serving enterprise customers, Hurwitz says.

IT leaders need to know more about the inner workings of cloud providers than some providers are willing to show, says Marty Colburn, CTO at Finra (the popular name for the Financial Industry Regulatory Authority), which oversees securities firms.

Integration emerged as a sticking point right away as Colburn explored whether to move e-mail into the cloud. He wants to be able to access archived e-mail quickly with his own extraction tools in case of audits for regulatory compliance. But he is frustrated that the vendors he's talked to so far won't reveal much about their architectures, claiming they don't want competitors to know how they do business. "Without that," he says, "how can you tell how to build integration? We're not into buying a black box," he says.

**No Easy Answers**

You may think that you can postpone using cloud services at all until integrating them becomes straightforward. But you can't. Employees can bring SaaS applications—one flavor of cloud computing—into your company pretty easily; all they need is an American Express ([AXP](http://finance.cio.com/idg.cio/quote?Symbol=AXP)) card and the will to circumvent IT, says Don Goin, CIO at auto loan company Santander Consumer USA. The company is a division of the $18.7 billion banking giant Banco Santander ([SAN](http://finance.cio.com/idg.cio/quote?Symbol=SAN)).

Last year, some Santander Consumer employees in the marketing department brought in tools from CRM vendor Salesforce.com. Though it wasn't part of Goin's immediate plans, it became established quickly and he let it stand. Then employees started to use the Force.com development platform to build custom business intelligence tools that didn't comply with the company's existing standards. Goin appointed an IT team to bring those projects in line with the rest of the company's BI initiatives.

"I am 100 percent responsible and accountable for all technology and every shred of data that moves in and out of my company," he says. Goin doesn't want IT to be seen as "the say-no people," he says, but end users may not foresee the difficulties of meshing new products with existing technology. "On-premise, we have technology standards. Nothing like that exists in the cloud," he explains. "If business users adopt these things, we CIOs are challenged in IT to figure out how to integrate [them] with the rest of our world."

Goin sees a parallel between cloud computing and the early client-server days, when business users might have bought a new point-and-click development tool and built their own software without IT's help or knowledge. "I was at Southwest Airlines ([LUV](http://finance.cio.com/idg.cio/quote?Symbol=LUV)) at the time, and it wasn't uncommon for a pilot to go home and develop a crew-scheduling application with PowerBuilder and say he wanted to put it out to everyone," Goin recalls. "Those systems eventually worked themselves back into IT."

Even when cloud computing is a firm goal, unexpected bumps arise. The Web makes the cloud possible, but many of the legacy systems that cloud applications need to communicate with weren't built for online use. Middleware that translates between data formats will be necessary and, as in the early days of the Internet, corporate IT often will have to build it itself.

Big vendors, such as Salesforce and NetSuite ([N](http://finance.cio.com/idg.cio/quote?Symbol=N)), which sells e-commerce and CRM software, offer good integration tools for popular business applications, such as software from Oracle ([ORCL](http://finance.cio.com/idg.cio/quote?Symbol=ORCL)), says Stuart Appley, CIO at Shorenstein Properties, a private company that owns and manages commercial real estate. But they don't have tools to interact with older or niche providers, much less to systems you've developed in-house.

For example, Appley uses a hosted version of a key property management system from Yardi Systems that Yardi runs on an IBM ([IBM](http://finance.cio.com/idg.cio/quote?Symbol=IBM)) AS/400 server. When he wanted cloud versions of other applications to exchange data with the Yardi software, neither the application vendors nor Yardi had a utility written specifically to link their systems. Appley's staff had to write interfaces in RPG, the programming language IBM uses in the AS/400. Appley wasn't surprised, but it was one extra step.

Meanwhile, a new invoice-scanning and approval workflow system that he just rolled out uses Microsoft's ([MSFT](http://finance.cio.com/idg.cio/quote?Symbol=MSFT)) BizTalk Server to route information to and from the company's various on- and off-premise systems. BizTalk will manage data that different cloud applications process in different formats, including FTP, various Web services and custom APIs, he says.

"We're taking data from one cloud application to another. We're bringing it to us as the intermediary, transforming it and sending it off," he says. Shorenstein had signed up for various cloud and SaaS systems before Appley arrived in 2007 and now he's integrating them all. BizTalk will be the hub, he says. "We have 10 different ways we pull data and only a few key people know how, so we're doing this BizTalk foundation now."

Meanwhile, Hurwitz, the consultant, advises CIOs to proceed with caution when working with a cloud vendor's own APIs and integration tools. Getting penned in with proprietary APIs could make it harder to move to a less-expensive, more-efficient provider if the time comes, she says. Several organizations are working on cloud computing specifications, but the ideas are new and so far no guidelines have been approved by standards bodies.

For example, Distributed Management Task Force, a group of software and hardware vendors, recently finished a spec called the Open Virtualization Format (OVF) that's designed to promote cloud interoperability. The task force submitted OVF to the American National Standards Institute and to the International Organization for Standardization. Standards bodies will test the spec this year, along with contenders from the [Organization for the Advancement of Structured Information Standards](http://www.oasis-open.org/who/) and the [Cloud Security Alliance](http://cloudsecurityalliance.org/). A winner could be as influential as XML has been for Web-based data exchange, Hurwitz says. (See "[Make Sense of Coming Cloud Standards](http://www.cio.com/article/593307/Cloud_Computing_5_Emerging_Standards).")

While those groups work on their proposals, she adds, vendors are hoping that their own APIs will become de facto standards, like Adobe's ([ADBE](http://finance.cio.com/idg.cio/quote?Symbol=ADBE)) Flash technology has become for interactive Web applications. "Salesforce, Google and Amazon would all like every other cloud vendor on the planet to use their APIs," she says.

Draw Yourself a Picture

The key to cloud integration success is settling on a design for your integration scheme, says Matt Hahn, CIO at PDS Tech, a staffing firm that supplies engineers and IT contractors to companies such as Boeing ([BA](http://finance.cio.com/idg.cio/quote?Symbol=BA)). But because cloud technologies change quickly and standards aren't yet set, he says, planning involves a certain amount of risk. Hahn hopes he'll be able to apply the lessons he's learned in SaaS integration to help him with cloud-integration projects.

PDS Tech uses Salesforce.com, Taleo's staff recruiting and tracking software, and Journyx's Timesheet package, which lets PDS Tech contractors submit their work hours and expense reports online. The company uses the Lawson S3 payroll, invoicing and financials suite, which it runs on its own servers, to orchestrate data hand-offs between systems.

Each vendor has tools to connect its software to other packages, Hahn says, but this combination of vendors didn't have pre-existing tools to support each other. The vendors offered to build interfaces, but Hahn said no. He used the vendors' integration tools, but had his staff do the work because, he explains, they know their company's business processes better than the software and service vendors do.

Hahn switched to SaaS to save money as the economy soured, and he found immediate support from senior executives. The company has since saved $600,000 to $700,000 per year on infrastructure, upgrades and staff costs, he says. "We're a $345 million revenue company. That's enough [savings] to get eyebrows raised."

Making the in-house Lawson suite the clearinghouse for data integration, with the off-site systems acting as spokes that send data to that hub, decreases the chances that data will get out of sync, he says. It's clear which system has the most current, authoritative data.

In Shorenstein's set-up, where BizTalk will be the orchestrator, CIO Appley says that having only one version of the truth has always been important to making decisions driven by data. But because cloud computing requires so much control be relinquished to vendors, keeping data in sync is a bigger challenge. "Make sure you have a strategy," he cautions.

**The Network Factor**

Eventually, cloud vendors will develop or buy tools—whether or not they're based on open standards—so their customers can integrate whatever they want, predicts Ken Harris, CIO of Shaklee, a consumer products company. It's vital to any cloud vendor's future prosperity, Harris points out. "They don't have an effective business model if they can't rapidly and conveniently connect" with customers' on-premise systems.

Shaklee runs several SaaS applications, including a data warehouse, a CRM system, an address-verification service and a Web marketing package. Integration of some of these systems has meant using third-party tools. For example, Shaklee uses PivotLink, a business intelligence and data warehousing tool, to collect data from internal databases as well as from such applications as order entry and inventory.

"I'd have to integrate them even if they were internal," Harris notes. The difference with cloud-based technologies, he continues, is that locating systems off-site adds a network reliability component. When you want several applications to make smooth data hand-offs, a lot depends on having the networks they use remain up with plenty of capacity. That's something CIOs lose some control over when they contract with cloud vendors, he says.

Integration can suffer when networks bog down, agrees Rob Adams, CIO of Bay and Bay, a family-owned freight mover. Bay and Bay already uses Salesforce and plans to port more of its applications off-premise, he says. To pass month-to-date metrics about Bay and Bay's customers between Salesforce and on-premise systems, the company bought Informatica, a data-integration tool that Salesforce recommends.

Informatica pulls the data from two systems running at Bay and Bay—a transportation-management application that routes trucks and an IBM DB2 database for analytics—and pushes it to Salesforce.

Network downtime is a rare problem, Adams says, but still one that CIOs should address by having redundant connections on-premise and also by specifying minimum uptime—and the consequences of not receiving that uptime—in service-level agreements. For a small or midsize company without many redundant systems, he says, an "Internet connection is really going to be [your weakest link](http://www.cio.com/article/523165/5_Things_You_Need_to_Know_about_Platform_as_a_service)."

Still, some industries may find only marginal use for cloud computing because integration can't be done as transparently as it can on-premise, says Colburn, the Finra CIO. Financial services companies must deal with so many compliance issues that a clear and complete view of their vendors' operations is imperative, he says. For example, like other securities exchanges and associations, Finra must adhere to the strict recordkeeping regulations in the Securities Exchange Act, which require keeping many documents, including e-mail messages, for five years. For the first three years, they must be "easily accessible." If a cloud provider won't specify exactly where Finra's e-mail is at any given time, Colburn says, he can't be sure that it is easily accessible. So for now, Finra's e-mail will stay in the regulator's own data centers, he says.

Dan Greller, co-CIO at Legg Mason ([LM](http://finance.cio.com/idg.cio/quote?Symbol=LM)), a global asset-management firm with $685 billion under management, hasn't put any systems in the cloud. Security isn't good enough yet and integration challenges give him pause, he says. "Commodity" applications, such as help-desk management, would be best suited for early cloud experiments, he says, in part because they don't need to be tightly integrated with Legg Mason's core business systems.

Bad integration can degrade overall application performance, which a financial services firm can't afford, he says. "Going to a more distributed computing model always brings up concerns about performance, and cloud is extreme distributed computing," he says. For example, if an analytics application running on-premise draws data from different transaction systems in the cloud, business analysts have to know how the integration occurs and with what latency so they don't make decisions or run analyses on wrong or old data. (See "[When Integrating Cloud Apps, Stay Focused on Users](http://www.cio.com/article/590760).") So while Greller doesn't dismiss cloud computing, he wants to see how standards evolve before making a serious commitment. If he knows that any cloud vendors he might work with will adhere to solid standards, then integration will be easier and more reliable, he says.

**Money Isn't Everything**

Cloud vendors may have technology and pricing that appeal to cost-cutters, but some vendors haven't yet figured out how to be business partners with CIOs who aren't looking only to save money, says Steve Cranford, a managing director at PricewaterhouseCoopers.

CIOs considering ways to improve operations, generate revenue and find competitive advantage don't just want to hand over critical systems to cloud vendors simply to lower costs, says Cranford, who consults with CIOs building business intelligence and data-management systems. Some CIOs want cloud vendors to consult with them about bigger goals, including integrating competing cloud systems with each other and merging cloud systems with those on-premise. Cloud providers are taking some steps toward providing this capability. Amazon, for example, works with Capgemini to help CIOs evaluate cloud offerings. Verizon ([VZ](http://finance.cio.com/idg.cio/quote?Symbol=VZ)) offers "vendor-neutral" cloud consulting. But consulting is not central to cloud vendors' business models, Cranford says—at least, not yet. "Most cloud providers are heavy technology companies—speeds, feeds and firewalls."

Colburn, who has piloted some cloud applications, agrees. "We're seeing maturity issues with some of the product lines," he says. "We and they have to walk before we run."