

just add water

To build a replica of 15th century Venice in record time, architects used 21st century technology

BY ANNE STUART

Even by Las Vegas standards, the Venetian Resort, Hotel & Casino is some piece of work.

It's extravagant: Developer and Comdex founder Sheldon G. Adelson will spend \$3 billion on the Italian-themed resort, hotel and casino in the heart of the glittery Strip.

It's mammoth: The Venetian is scheduled to open this spring with 3,000 rooms; if developers follow through with plans to add 3,000 more in two years, it will be the world's largest hotel.

It's a true replica: Working with historians, architects designed faithful reproductions of Venetian landmarks such as St. Mark's Square, the Rialto Bridge and the Grand Canal, complete with gondolas. **It's upscale:** Visitors can buy

Reader ROI

IN THIS STORY READERS WILL LEARN

- ▶ The shortcomings of much architectural groupware
- ▶ How, years after a project's completion, careful record keeping can save a developer millions
- ▶ Why big construction companies invest in software development

Drawing Quarters: Architect and CIO Larry Rocha says without ProjectNet, each project update would have cost \$2,400.



BUILDING WITH EXTRANETS

Kenneth Cole shoes or a Movado watch, get a massage at the Canyon Ranch spa, dine at Wolfgang Puck's and retire to lavish suites twice the size of most in town to catch up on business with an in-room combination fax machine-photocopier-printer.

And even by Vegas standards, the Venetian is one high-rolling venture. Delaying the grand opening by just one week

underway, members say it kept the project on deadline.

"If we weren't using this kind of technology, we would be behind schedule," says Larry Rocha, an architect and CIO for one of the Venetian's two architecture firms, Wimberly Allison Tong & Goo Inc. (WAT&G) of Newport Beach, Calif. "We were looking for a faster, better way of communicating with

"There was no time for couriers; everyone wanted to know everything in minutes."

—DOUG COCHRAN

would cost developers \$7 million in lost room charges, restaurant tabs, show tickets, purchases and, of course, casino haul. So to help keep construction on track, the project's architects put the Web to work. Architects, engineers, designers, consultants and contractors—some of them thousands of miles from the construction site—established a virtual team and put almost everything connected with the project online.

The Venetian's extranet, built with a collaboration tool called ProjectNet, contains 4,500 blueprints and computer-aided design (CAD) drawings, hundreds of photos and illustrations, legal documents, budgets, letters, forms, project schedules and bulletins, messages and press clippings.

Team members used ProjectNet to chat or mark up each other's work in real-time, move along documents and drawings, and contribute to e-mail forums on a variety of design and construction topics. With a browser and an Internet connection, they could check in from Vegas, the real Venice, Venice Beach or anywhere else in the world.

Normally a project of such magnitude would take three to four years, perhaps longer, to design and build. But in the scramble to cash in on the city's popularity, developer Adelson and his partners wanted to open early in 1999. At the same time, they insisted on higher-quality construction than the typical movie-set facades of other Las Vegas theme resorts, demanding, for example, solid rather than hollow columns for the Venetian palace-casino. So with a two-year timetable and just over a year from groundbreaking to grand opening, the project team couldn't afford to lose even one carefully choreographed day. And although the team didn't begin using ProjectNet, a brand-new service from a brand-new company, until construction was

our team." His colleague Rafael Velazquez, an architect and WAT&G's computer-aided design coordinator for the Venetian project, agrees: "The real value of it is the speed."

The Venetian's project management team includes 23 people from different disciplines such as architects, landscapers, mechanical engineers, electrical contractors and kitchen and design consultants.

Normally, Rocha says, project team members—located throughout Nevada, on both coasts and temporarily in the real Venice as well as in Las Vegas—would share information by putting drawings and other documents on paper or disk, then sending them to other teammates by courier, losing a day each way. "It was almost a full-time job just to coordinate distributing all the information to everyone on the team,"

Rocha says. And a costly one as well: It costs about \$100 to produce each disk and send it by courier, so for the Venetian's team of about two dozen members, each project update cost \$2,400.

"This is the largest project we've worked on in our 50-year history, so it became very important to share information. I doubt that we could have done it the traditional way," says Doug Cochran, WAT&G's CAD manager. "There was no time for couriers. Everybody wanted to know what everybody else was doing in minutes and hours rather than in days."

At the start of the project, there was no single method for getting those updates. Some communicated using a Lotus Notes database; some used a separate electronic bulletin-board system. Some had access to CAD drawings, and some didn't. Some communication happened by phone,

Liner Notes

Company name: Blue-Line/On-Line Inc.

Founded: January 1997

Revenues: \$4.6 million projected for 1999

Based: Palo Alto, Calif.

CEO/President: Jas Dhillon

Employees: 26

Business: Internet-based project management services offering secure collaboration capability for project teams, particularly in architecture-engineering-construction industry

Products/Services: ProjectNet subscription-based collaboration service; ProjectNet LT entry-level service for smaller projects; ProjectNet InterPulse intranet/extranet collaboration tool

Major customers: Bechtel Group Inc.; Gensler; Four Seasons Hotels

URL: www.bluelineonline.com





Electric Blue: Blue-Line/On-Line CEO *Jas Dhillon* says his product's audit trail can help clients defend themselves in lawsuits years down the road.

some by e-mail, some by courier. Team members quickly agreed there had to be a better way to share information.

Blue-Line/On-Line Inc. was not yet founded in 1996, as the Venetian design work began, so the project team tried first to get everybody on the dial-up bulletin-board system. But the system was unreliable, expensive and slow. "It crashed all the time," says Rocha. "I had to dial up the BBS, which was a long-distance call," says team member Mark Tatro, CAD Systems manager for Reno, Nev.-based MSA Engineering Inc., the Venetian's electrical contractor. "It took four to eight hours to download everything."

Despite those headaches, team members worried about switching from the bulletin-board system to a groupware solution. They couldn't spare a single day for training on a new technology. They also worried about security lapses that might further set back construction. Finally, they needed rigid record keeping that was lacking in most groupware to track the project's progress.

They had no shortage of collaboration tools to choose from—AutoDesk, eProject, eBuilder and BidCom, to name a few—but most either weren't Web-based or weren't tailored to the demands of the architecture-engineering-construction industry.

The general-purpose tools don't address the unique needs of engineering, like being able to share blueprints and drawings, says Marty Gruhn, who, as vice president of Internet business solutions for Summit Strategies in Mesa, Ariz., tracks developments in that industry. Tools like ProjectNet, on the other hand, are designed by engineers for engineers, she says, allowing construction project teams to manage more people in more locations on bigger projects while saving time and money. The Blue-Line/On-Line team sensed demand for that ability early on.

Late in 1996, about the same time Adelson was imploding the Sands, three former KPMG Peat Marwick managers, all with

construction industry experience, left the consulting firm to start their own company, providing project management tools and services to the architectural, engineering and construction industries. Their investors included construction giants Gensler and Bechtel Group Inc., which has since become part owner of the company. The partners, initially working out of a 300-square-foot room above a furniture store, named their company Blue-Line/On-Line, an allusion to the blue lines of architectural drawings. Three of the four founders are still with the company: *Jas Dhillon* as CEO and president, Yogesh Saini as vice president for product management and Ashok Segu, CTO.

Grand Venetian Ingredients

- 2.3 million** pounds of sheet metal
- 15 million** square feet of drywall
- 8 million** feet of electrical wires
- 36,000** gallons of paint
- 19,000** doors
- 615** miles of crown molding
- 267,000** cubic yards of concrete
- 2,500** construction workers

Their 26-person company now occupies a 5,800-square-foot office in Palo Alto, Calif.

ProjectNet, one of several Blue-Line/On-Line collaboration tools and services (see "Liner Notes," Page 40), offers all the tools the Venetian team sought: high-speed document transfers, instant updating, security and a permanent record of who did what when.

That last function is critical because long after contractors hammer in the final nail, Dhillon and Rocha say, project teams still need audit trails for management purposes as well as evidence for lawsuits. (There's an old joke, Dhillon says, that all major construction projects take 12 years: 2 to build and 10 to get through all the lawsuits.)

By automating such audits, ProjectNet prevents the dog-ate-my-homework types of excuses common in the industry: It is typical for team members running behind to complain that they never received drawings faxed or sent by courier. "It saved us a couple of times," says WAT&G's Cochran. In one case, a consultant who blew a deadline blamed architects, saying he'd never received the necessary drawings. ProjectNet's auditing capability quickly demonstrated that designers sent the files well in advance and notified their teammate that they'd done so. He'd just never bothered to download them.

As for security, all data is stored on Blue-Line/On-Line's servers rather than on the customer's, making a security breach far less likely. Because the technology project is Web-based, Rocha says, and even the nontechnie kitchen consultants know how to use browsers, most mastered the system in a matter of hours.

For users, the main attraction is the ability to put almost everything involved with the project into one repository. ProjectNet

Venice in Vegas

Project name: The Venetian Resort, Hotel & Casino

Location: Las Vegas Boulevard ("The Strip"), adjoining Sands Expo and Convention Center

Projected Cost: \$3 billion

Opening: Spring 1999

Developer: Las Vegas Sands Inc.; chairman Sheldon G. Adelson, creator of Comdex computer trade show

Architects: Wimberly Allison Tong & Goo Inc. of Newport Beach, Calif., and TSA of Las Vegas

Height: 35 floors (480 feet)

Size: 63 acres

Theme: Renaissance Venice, including reproductions of Doge's Palace, 315-foot Campanile Tower, Rialto Bridge, St. Mark's Square and a three-foot-deep Grand Canal with gondolas

Primary market: Business and convention visitors, sophisticated leisure travelers

Phase I: Venetian Hotel Tower with 3,036 suites, shopping mall with 90 upscale stores and restaurants, 500,000-square-foot convention facility and ballroom, 116,000-square-foot casino with 2,500 slot machines and 118 gaming tables

Phase II: Scheduled opening mid-2001; adds second 3,036-room tower, 300,000 square feet of mall space and a second 100,000-square-foot casino

Rooms: All 700-square-foot suites contain bedroom, sunken living area, Italian marble bath, minibars, combination fax-copier-printer, three 2-line telephones, two 27-inch TVs and safes large enough to hold laptop computers

Amenities: Eleven-acre pool deck, rooftop Italian gardens, Canyon Ranch Spa, four-level Billboard Live performance center with VIP boxes and cigar bars, Vegas-themed Madame Tussaud's wax museum, restaurants overseen by renowned chefs Wolfgang Puck and Emeril Legasse

URL: www.venetian.com



accepts files in more than 200 formats, from AutoCAD drawings to Microsoft Word documents to Excel spreadsheets. Depending on their level of access, members can mark up drawings online using very simple tools like those found in any PC software paint program.

They can involve up to 100 users in real-time virtual designing, where what one person draws shows up on everyone else's screen. Once documents are saved to the system, team members can view "before" and "after" versions of the drawings, zoom in or rotate images and view a history to see who changed what. They can attach questions, suggestions or instructions ("Please move this window to the north wall," reads one architect's revision on a blueprint for the casino's second floor) and then forward the changes to other team members. ProjectNet updates and reloads only the changes, not the entire file; considering that engineering and architectural drawings can run to 100MB, that feature alone saves hours per day.

Tatro, the electrical engineering contractor who used to tie up phone lines for several hours daily with long-distance file transfers, now gets on the Web and heads for ProjectNet's site. When he logs in, the system alerts him to what's new: changed drawings, new

documents, e-mail messages, discussion in forums affecting his part of the project.

"You can be on the same page as your consultant, and you can both do the same thing, uploading and downloading the same information," says Velazquez, who worked with Tatro on the project. "He pulls something up, you pull it down, you put the revised version back up. All this is happening on the spot." Putting everything on the Web also cut the cost of having blueprints professionally reproduced, an expense that usually accounts for up to 2 percent of a construction project's

Betting on Technology

At Las Vegas's newest hotel, high-tech is part of the package

THE VENETIAN'S TECHNOLOGICAL INNOVATION won't stop with the resort's ribbon-cutting. CIO Steve Vollmer says the resort's management has one overarching goal for serving its target audience of convention and business visitors: "We want to make their lives easier."

The effort begins as guests walk in the front door of what will eventually be the world's largest hotel. To prevent the world's longest registration-desk lines, Venetian employees will circulate through the lobby, using pocket-size wireless devices to check in guests as they arrive.

In their suites, business travelers can set up shop using their three 2-line phones and combination fax-copier-printers. Checking out will be as easy as checking in, Vollmer says: "You can use the video checkout, and your [receipt] will be faxed to your room immediately. You grab it off the printer and you're gone, right by the front desk."

Vollmer, formerly CIO at New York-New York Hotel & Casino (see "Postcards from Near the Edge," *CIO*, July 1, 1997, and on the Web at [www.cio.com/archive/070197_](http://www.cio.com/archive/070197_amuse.html)

[amuse.html](http://www.cio.com/archive/070197_amuse.html)), says the IT staff can also create individual networks between hotel suites or between individual suites and the Sands expo center next door. The latter would allow, for instance, trade-show exhibitors to remotely access their exhibits while relaxing in their rooms at night. And guests who find time to slip away to the casino will find more than 2,500 slot machines linked to a system that tracks winnings, awards prizes such as dinner gift certificates and doubles their points on their birthdays.

—A. Stuart

budget. On a project the size of the Venetian, that minuscule percentage translates to more than \$1 million.

Another asset is the online RFI, or request for information, files. In a large, tightly choreographed construction project like the Venetian, where 2,500 workers swarm through the building in two shifts each day, people representing different disciplines must constantly track each other's progress and ask about possible changes. Paint and wallpaper crews, for instance, can start only after drywall teams finish. An architect might want to ask a mechanical engineer whether it's possible to move an air-conditioning unit from one wall to another. A contractor might want to let a buyer know it's running short on a particular style of door or molding.

ProjectNet logs the RFIs and the responses, creating a master Frequently Asked Questions (FAQ) file for future reference, a feature Gruhn, the Summit Strategies analyst, says creates a virtual institutional memory that helps keep construction on track if key players leave the project.

ProjectNet wasn't perfect. Architects still needed to send some very large files—500MB and up—by courier because they took too long to upload and download. And for the architects, ProjectNet was an added expense. Traditionally, Rocha says, clients reimburse architects for information-sharing expenses such as disks, phone calls and couriers, but the \$30 per month (and a onetime \$500 setup fee) for ProjectNet was paid entirely by Rocha's firm.

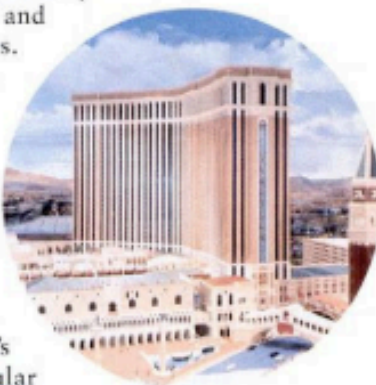
"At the moment," says Rocha, "clients are definitely on the leery side" about collaborative tools and services, forcing architects to absorb the expense for now.

But as the project nears completion, Rocha calls the investment worthwhile. "What's really amazing," he says, looking up at the cranes surrounding the Vegas version of the Doge's Palace, "is that two years ago, this was just a thought. It wasn't even going to be Venice. We didn't know what it was going to be. And now it's going to be the biggest hotel in the world."

But he and others say the long-term changes in the construction industry may ultimately prove even more astonishing than the appearance of Renaissance Venice in downtown Las Vegas.

"More and more demands will be put on us to act very quickly," Rocha says. "We're all being forced to gravitate toward a central repository of information we can feed out of."

Gruhn agrees. "This whole virtual engineering trend is going to be critical to companies competing in the next century," she predicts. "If you come in sloppy, late and 10 percent over budget, and the other guy came in early and 10 percent under budget...you aren't going to be in business." **CIO**



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