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— Sara Leavitt,  
Webmaster,  
Lawrence Hall of Science

## Lawrence Hall of Science at UC Berkeley

Scalable

**Intro:** UC Berkeley’s Lawrence Hall of Science was facing a growing problem with its technical infrastructure. Small, difficult to maintain, unrelated database applications were carrying the administrative load for the 350 staff members. Most of the applications had no ability to be Web-enabled. Using Sybase’s Adaptive Server Anywhere, EAServer, and PowerJ,® the Lawrence Hall of Science now has an Intranet hosting an integrated, productive suite of applications. Their J2EE™ solution has captured the interest of other IT groups within the University of California system. [www.lawrencehallofscience.org](http://www.lawrencehallofscience.org).

**Industry:** Education Information Technology

**Business Requirements:** Acquire a development environment to convert a largely unrelated set of databases and small applications so they can be grouped together under a unifying technology for data storage and Web access. The development environment needs to provide cutting edge, standards-based technology tools for future development.

**Architecture:** A mixture of desktop, Web-based, and pure J2EE Intranet applications on NT machines running EAServer. Java™ development was completed using the Sybase PowerJ IDE and Borland® JBuilder–Sybase Edition

**Products Used:** Sybase EAServer, Sybase Adaptive Server Anywhere, Sybase PowerJ, Borland JBuilder–Sybase Edition

**Results:** “e-LHS”, a suite of general-purpose Intranet applications built on Sybase technology for Lawrence Hall of Science staff members. With EAServer’s support for the latest J2EE standard, the development team is reaping the benefits of J2EE, including scalability and component reusability. In addition to improving the overall efficiency of the staff, the applications are receiving attention from other areas of the university.

### A Unified Field Theory for Application Development

People who have visited the city of Berkeley, CA will likely remember a large building on a hill above the city, conspicuous and distinguished, standing out from the surrounding urban clutter. This landmark is the Lawrence Hall of Science, part of the University of California at Berkeley. Built in 1968 to honor Berkeley’s first Nobel laureate, Ernest O. Lawrence, the Hall’s mission is to develop innovative programs for teaching science and mathematics to children.

As a scientific institution, the Lawrence Hall of Science tends to employ people, who, by their very nature, have little fear of computers. For the people managing the Hall’s technology infrastructure, this level of individual employee technical prowess is not always an advantage; recent years had produced a proliferation of unrelated point solutions. Using Sybase technology, the Lawrence Hall of Science has created a unified infrastructure of interoperable applications to replace the older solutions. Because the Hall’s solutions are open, standards-based, cost effective, and general-purpose, other divisions at UC Berkeley are interested in them for their own requirements.

### Defining the Problem is Half the Solution

Four years ago, the Technical Services group for the Lawrence Hall of Science took a hard look at the problems they were having with their existing technology infrastructure. With 350 employees, supported by

about a dozen mostly uncoordinated small desktop databases and applications, they knew they needed a comprehensive solution to knit the services into a centralized data system. The team began by writing down on a whiteboard all the items that required data management. By the end of the session, the entire whiteboard was filled.

“We had all of these different databases and we couldn’t share data easily. We had data duplications generating errors. It was difficult to provide management with information about what was happening at the Hall.”

– Carol Gray

Along with cleaning up the snarl of unrelated applications, whatever solution the Hall’s team chose needed to provide a robust development environment. The Lawrence Hall of Science doesn’t stand still; there will always be new projects needing to be built. The team needed a development environment capable of filling holes in their existing automation as well as supporting future projects. They wanted the platform independence of Java, coupled with the stability and innovation provided by an established vendor.

### The Right Vendor Listened

“We listed our problems and then we tried to figure out what would solve them for us. We contacted what we understood to be the vendors in this area.”

– Phil Stone

After defining the individual features needed for their solution, they went shopping for a vendor among the usual candidates. What they found all too often was a one-size-fits-all attitude, bordering on arrogance. Phil Stone remembers this well, “We didn’t really quite know what questions to ask because it was a new level of technology for us. We would go in and say, ‘This is the size of our organization, and here is what we want to do.’ Three companies made presentations to us. In the other two cases, except for Sybase, the presentation was targeted about 2000 employees over our head. Nobody seemed to have a sense of the scale we were shooting for. They were trying to sell us things that really didn’t apply to us. In fact, in one case, sales people came in and started the meeting by telling us what they wanted to sell to us. It wasn’t until we sat down with Sybase that the salespeople listened to what we needed and started talking to us about how they could solve problems for our scale of organization. Sybase started out demonstrating some things they thought we would be interested in. As soon as we started asking questions, they immediately steered toward what we were asking—and completely off the cuff, talked about the things we were interested in.”

“One of the things that attracted us to Sybase was Adaptive Server Anywhere’s proxy tables that gave us the ability to access multiple formats transparently.”

– KATHLEEN CONNORS

### Lessons Learned: Invest in Training

When the LHS development team purchased Sybase tools, they did not purchase training. In addition to coming up to speed on the Sybase products, they were learning Java—and the very real complexities of J2EE as it applies to Internet and Intranet development. The team felt some initial pain from the steep learning curve. Based on experience, Phil Stone recommends, “Make sure you have a training budget when you embrace an entirely new technology. If you don’t, you end up paying for it in salary anyway.”

“Start simply, get something working so you are not overwhelmed by the alphabet soup of J2EE. Learn one little piece of the alphabet first, JSP for instance.”

– Phil Stone

### Grasping the Essence of J2EE

The self-taught developers created their initial database and desktop applications with Sybase Adaptive Server Anywhere and PowerJ. For specific answers, they made good use of the Sybase field support organization. As they began their J2EE development, they were not sure where to start. What the team lacked was an overall grasp of the J2EE technology solution as it applied to their needs.

The developers attended a Sybase Users Group meeting in San Francisco. At the meeting, Jim Kawanami of Sybase gave a presentation on J2EE and model-view-controller architecture. After the presentation, the Lawrence team talked to Jim and he offered to come to their site and give them a few pointers. Kathleen Connors talks about Kawanami’s contribution to their J2EE development, “Jim came to our site and drew up several diagrams. He gave us an overview of model-view-controller as it pertains to J2EE. After we had thought about it for a while, he came back and he brought some code for us to get some idea of what our J2EE system might look like in reality.” Phil Stone adds, “His timing was perfect for us. Jim really helped us connect the dots. After that, he continued being there as an advisor, helping us solve minor issues that came up.”

### J2EE Bears Fruit for the Hall’s Intranet

Once the developers gained traction with J2EE, they developed a common set of pure, EAServer-based, J2EE applications, collectively referred to as “e-LHS”. The applications include an Employee Vacation and Sick Leave application, an Employee Directory Update application, and a Service Center Job Request application. The applications are deployed over the Hall’s Intranet to staff members. Coded using Sybase PowerJ, the applications were built with a J2EE model-view-controller architecture using session and entity EJBs at the model layer, servlets as controllers, and JSPs for the presentation or view layer.

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– Sara Leavitt

The Hall is seeing the advantages of their automation based on Sybase technology. Response times are down and service levels are noticeably higher. Administrative employees are noticing a reduction in the time they spend dispensing information, and the employees seeking the information are spending less time acquiring it. Sara Leavitt, the Lawrence Hall of Science Webmaster, gives an example of this compounded timesavings, "People can log in and see their own vacation and sick leave. Instead of going into the office and bugging the person who was keeping track of it in Excel and saying, 'Oh can you print me out a report?' Now they can just get online, log in with a secure id, and get the information they need."

EAServer's absolute support for the J2EE specification is allowing the team to start realizing the advantages of J2EE. Sara Leavitt explains some of the benefits, "One of the promises of J2EE is having team members specialize in individual aspects of a project and then putting it all together. For instance, I'm using Dreamweaver to design the JSPs that use JavaBeans created in JBuilder." Kathleen Connors tells of the ease of maintaining the J2EE code, "Because we use the model-view-controller approach and build modular code, we can have different developers come in with different ideas and ways to improve our code. It's reasonably easy to incorporate their changes through all our code."

**"The whole promise of components is really coming through. You can reuse, and more easily maintain the work you have already done."**

*— Phil Stone*

As the team's development skills have matured, their tool use is also maturing. They recently started using Borland's JBuilder for their development. As a part of its ongoing commitment to J2EE, Sybase has made JBuilder an integral piece of its e-Business infrastructure platform and is shipping the Sybase Edition of JBuilder. Phil Stone is enjoying the new tool, "I did my first development using JBuilder and was having a wonderful time generating version 2 EJBs right from database schemas. The experience I have had so far has been great. For EJB 1.1, Kathleen had to write a whole bean-managed persistence layer using PowerJ."

**"In many ways we have exceeded our expectations. When I was dabbling with JBuilder and working on our new EJBs; I found a tool that will present a UML diagram based on our data concepts. I didn't think we'd get to as high a level this quickly."**

*— Phil Stone*

The Service Center Job Request application is getting excellent reviews from users and the technical service people. Before the Job Request application was built, when service technicians finished a job they would have to walk back to their office and get the next task on the queue. Now the technician can log in from anywhere in the Hall, update the finished job status, and check the job list. Employees filing service requests can check the status of their requests online. Because their requests need to be composed and typed in, the information describing the problem tends to be clearer than the old informal verbal method; this makes the technician more efficient. Sai Tsui, Director of LHS Technical Services and Development, likes the increased efficiency, "The technical person gets a quick, concise and easy to read description of the problem from the Job Request system, and can focus on diagnosing and fixing the problem." The Job Request application builds a knowledge base of problem resolutions and logs the individual service requests. The ability to quantify levels of service makes a manager happy. Sai Tsui notes, "If I have to make a case for hiring more technicians, I have all the supporting data I need."

Increasing automation, coupled with less foot traffic interruption, has an additional benefit of raising the team's collective productivity. Phil Stone explains, "The Job Request application is saving time for us, too. Because we are all in one office, people used to walk in and say, 'Who can help me with my computer?' We would all have to stop what we were doing and sort it out. With the decrease in traffic, we are getting more done. This is an intangible, but very real ROI."

#### **Pet a Snake—101 Unusual Things to Do at the Lawrence Hall of Science**

The Hall is a busy place, full of opportunities for visitors. To help visitors know the breadth of available pursuits, the Hall's public Website has an area called "101+ Things to Do". This details all the different activities—from building a cardboard kazoo, to petting a snake, to exploring Mandelbrot Sets. This is a fluid list fueled by the creative minds of the Hall's staff. Each activity has its own Web page. For a Webmaster to maintain all this information through purely static pages would be an enormous amount of work.

To help manage this list, Webmaster Sara Leavitt built an application so the staff members who dream up the activities can populate the corresponding Web pages. This application is the first of many similar applications the technology team is planning. She talks about distributing the workload, "The first implementation is called '101+ Things to Do', and I think we actually have 133 things to do right now. There is a secure site where people can log in, enter the information and select a publish flag. Once it becomes published, it's added to the publicly accessible pages. Our Intranet is becoming more crucial to our business by coordinating what goes on behind the scenes. As the Webmaster, I'm interested in how the Intranet hooks into the public side of the Web server. I'm also very interested in getting the work done in a decentralized manner so I'm not hand-coding all these pages. People around the Hall can be doing the data

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entry. This is just the beginning, and I want to do more things like it. One example is public calendars, so people can plan their visit here.”

## Results Open Up New Uses for Sybase Technology

Collecting what had been scattered data into a single repository is opening up new opportunities for using the information. The utility of the Intranet J2EE applications running on Sybase EAServer is generating interest outside of the Technical Services group. “We have people now getting excited about the possibility of doing market research on data that wasn’t even there before.” Says Phil Stone, “If it was there, it was inaccessible. It was proprietary, or in a format that only the designer could understand. Now that people are seeing what we have done, we have quite a list of things to do, and people are clamoring to access the infrastructure we are building. We have had some suggestions for reusing the Job Request application.”

“We originally built the Job Request application for the Hall’s tech services, people have suggested using it in other departments within the Hall, and possibly throughout the university. This is a big return on investment.”

— Phil Stone

## Sharing the Vision

The Lawrence Hall of Science development group will be presenting their EAServer-based J2EE application suite at the University of California Computer Services Conference. The annual conference is an assembly of U.C. campuses system-wide who get together to share IT best practices. According to Sai, “Our Sybase field support engineer, Jim Kawanami, was very helpful in working with our developers. I would like to personally thank him for all his efforts. We have invited him to attend this year’s conference.”

The University’s chancellor has directed the start of a multi-year effort to move common university services to the Web under the auspices of an “e-Berkeley” initiative. The Lawrence Hall of Science developers recently formed a technology group called jNet for sharing information on J2EE and Java development with other people on campus. The Lawrence Hall developers are demonstrating their Sybase powered J2EE applications to the jNet group and doing a bit of lobbying to e-Berkeley.

Sara Leavitt talks about the e-Berkeley/jNet connection, “There’s a project on the Berkeley campus called e-Berkeley. It’s all about putting business on the Web so people can, for example, get a parking permit or payroll statement on line. From our point of view, J2EE makes the most sense to do e-Berkeley. Some people are using other things for e-Berkeley, but I believe the more cutting edge development is

happening with J2EE. The jNet group is a group of about 40 people on campus. We just started it up a couple of months ago and there’s a lot of excitement with this technology.”

## Leveraging the Solution With New Projects

The Lawrence Hall of Science development team has built a lot of momentum with their e-LHS applications. Along with the external interest, their internal development plans are accelerating. They have several projects in the planning stages; they want to move their Intranet into a portal-like environment to streamline internal information sharing among the Hall’s staff, and to provide more mechanisms for publishing to their public Website. They will continue converting their older, outdated applications to the centralized Sybase solution.

A near-term project is a Web-enabled course registration application. The Lawrence Hall of Science is a proving ground for math and science instructional materials for children, ages 2 years through high school. LHS offers popular public courses for kids. In fact, the courses are so popular, there is quite a bit of competition at sign up time. In some cases, people began physically lining up outside the Hall at 4:00 am for a 9:00 am registration. By Web-enabling the registration process they will build a bridge between their Intranet and the public Website. The automation will also simplify implementing a lottery approach to ease the competition for the most popular classes.

## Tempered by Experience

The Lawrence Hall of Science development team has the confidence and vision that often comes to the self-taught. Sybase’s fully conformant J2EE products, combined with Sybase staff members, who know how and when to shine a light, have helped them along. They have come a long way, from a problematic set of applications with only a hazy understanding of available solutions, to developing a solid set of EAServer-based J2EE applications. They have excitement and a justifiable pride in their accomplishments.

*The opinions or statements expressed herein should not be taken as a position of or endorsement by the University of California, Berkeley.*

“We’ve been able to do just about anything we wanted, very quickly and very easily. EAServer’s been reliable and easy to use.”

— Kathleen Connors

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