Application for 2014 University of California Larry L. Sautter Award for Innovation in Information Technology

Project Title: Chemical Inventory System / Chemical and Biological Information System (CIS/CBIS)

Submitted: Safa Hussain
IT Services, University of California, Davis
Email: smhussain@ucdavis.edu
Office: 530.633-7232

Diana Cox
IT Services, University of California, Davis
Email: dicox@ucdavis.edu
Office: 530.752.6687

Project Leaders
• Cheryl Lloyd, Executive Sponsor, Chief Risk Officer, UC Office of the President
• Safa Hussain, Director, Information Technology Services, UC Davis
• Tod Ferguson, CIS Taskforce Chair, UC San Diego
• Travis Clark, CIS Taskforce Co-Chair, UC San Francisco
• Russell Vernon, EH&S Director’s Liaison, UC Riverside
• Ken Smith, UC Laboratory Safety Manager

Project Team Members
The CIS/CBIS project’s success has been dependent on the support of the entire IT Services organization, as well as the University of California, Environmental Health & Safety department. As part of the development process at IT Services, numerous staff and faculty provided guidance, feedback, expertise, and insight contributing to the success of the project.

The team members listed below made up the core team:
• Cat Keeley, Project Manager
• Christine Carcamo, Business Analyst/Quality Assurance Analyst
• Charles Bookman, System Administrator
• Jay Ballinger, UC Systems and Integration Architect
• John Yeh, Student Intern
• Taniya Prabhakar, Student Intern

The team members listed below made up the functional team:
• Thor Benzing, UC ANR
• Russ Blackmar, UC Berkley
• Stewart McMaken, UC Berkeley
• Andrew Majewski, UC Davis
• Barry Williams, UC Davis
• Dale Saunders, UC Irvine
• Dick Sun, UC Irvine
• Petros Yiannikourou, UC Irvine
• Daniel Keck, UCLA

• Joan Burg, Analyst
• Eric Pereira, Quality Assurance Analyst
• Diana Cox, Product Portfolio Manager
• UC-wide CIS Taskforce, Business Product Owner
• Bijan Fouladi, Developer eCompliance
• Functional Workgroup Members (see attachment)
Summary

The Chemical Inventory System (CIS) is a web-based system that facilitates the collection and storage of information related to chemical types and amounts within campus laboratories and facilities. There has been increased focus and scrutiny on our University of California research laboratories—particularly those laboratories which store and use dangerous chemicals. The UC Office of the President (UCOP) responded to the need for increased controls to promote safety by sponsoring a suite of applications concerned with the safe identification, accounting, usage, and disposal of these chemicals. The Chemical Inventory System / Chemical and Biological Information System (CIS/CBIS) is a 3rd party system that UCOP funded to fulfill this need while providing the faculty and researchers with an additional tool that helps them in their research with chemicals. A union was formed between eCompliance, UC ERM Center of Excellence for Technology (IT Services at UC Davis) and the UC-Wide CIS Functional Workgroup to roll-out CIS/CBIS to all 10 UC campuses.

The CIS/CBIS systems facilitate the collection of both UC laboratory and facilities chemical inventory data. CIS integrates with CBIS to allow a PI to search for chemical structures, print placards, and manage chemical inventories. CIS also helps comply with the following regulations and agencies:

- the Cal/OSHA Hazard Communication standard
- the Community Right to Know Act and the California Hazardous Materials Business Emergency Plan regulation so fire fighters know the hazards when responding to emergencies.
- the reporting and security requirements of the Department of Homeland Security Chemical Facility Anti-Terrorism Standard so the campus can prevent aggregate chemicals from exceeding their thresholds or allow timely reporting when they do.
- the California Fire Code Article 79 and Article 80 limiting the volumes of allowed hazards to be stored and used by fire code hazard category.
- the Cal/OSHA Carcinogen Report of Use Requirements providing the Chief of the Division of Occupational Safety and Health with the mandated reports.
- environmental air quality standards, which require estimating and paying for the air emissions from fume hoods.
- that new building designs include estimating and modeling probable chemical inventories.
- that decision makers be informed on the hazard class restrictions for use of pyrophoric chemicals in buildings not fully protected by an automatic fire sprinkler system.
- that standard operating procedures in the labs be created and comply with the UC Regents Agreement with the Los Angeles District Attorney.

Project Description

How It Works

In order to enter a chemical inventory into CIS/CBIS, a Principal Investigator (PI), or Authorized User (AU) for the PI, must first select a location. The location data in CIS is received from each campuses’ facilities system of record via a web service from the UC IT Services Core Services System. CIS requires each Principal Investigator (PI) to identify the locations where chemicals are stored and used and once a location is selected, the PI can begin to build an inventory in the CIS/CBIS system. The CIS application uses this data to produce safety compliance reports for the campus to be shared with regulatory agencies and first responders. CIS also synchronizes with a chemical library list that is managed and updated collaboratively by regulatory agencies, private-sector companies and academic institutions. The chemical list stores mixtures and their components, as well as a variety of hazard classes.

The CIS interface has been designed to be quick and intuitive for users. Principal Investigators or Responsible Entities (“PIs”) and their designees enter, update and manage their chemical inventories and use locations, while Administrators or other designated roles and personnel, manage users in the system and extract data through searches, ad-hoc queries.
and pre-defined reports. Emergency response users have read-only quick and easy access to relevant data during an emergency.

The Principal Investigator Interface includes:
- Ability to add and remove use locations
- Ability to add and remove additional users
- Ability to add and remove individual chemical inventory containers
- Ability to download inventory to an Excel spreadsheet and to upload an Excel spreadsheet containing inventory

The System Administrator interface includes:
- Field-specific help editable by the Administrator
- Email notification options
- System-level attributes such as last login time, update time, etc.
- Ability to print door placards

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**Figure 1: Graphic of system generated door placard**

The System Administrator interface includes:
- Ability to define user roles
- Ability to associate users with roles
- Ability to add/inactivate users
• Ability to search the database—The product’s metadata construct allows for a Google-like search across ALL data fields. Partial searches, numeric and date searches, and compound logical searches are all supported. The search can be by name, PI, hazard class, or any other attribute. Searches can be saved for future reference.
• Many pre-defined reports
  o Summaries by hazard class, CAS, Location, department, control areas, and other criteria
  o Searches and reports can be exported to most standard data formats
  o First responder interface
• Fast, easy and relevant Smart-phone interface available (Haztrakr app on the Android marketplace – iPhone app coming soon).

CIS Test URL
The CIS/CBIS sandbox allows users to access a demo environment and is available at the following URL:
CIS/CBIS Principal Investigator Sandbox
CIS System Administrator Sandbox

Project Benefits

Improving UC Chemical Information
There are many benefits to this new application and one of the most important ones is providing a centralized repository of chemicals across all UC systems. This project has been made possible due to the commitment from the UC-wide CIS Functional Workgroup. The workgroup is an extremely dedicated group of individuals committed to the task of implementing CIS/CBIS across all UC campuses. Working with UC Davis IT Services and the vendor, eCompliance, the group acts with the utmost professionalism to collaborate on issues that arise as a result of a campus converting existing legacy chemical inventory data to a new UC-wide system. This collaboration is accomplished through weekly technical meetings, bi-weekly meetings with the Chair and Co-Chair, and monthly sessions with the entire workgroup.

Interoperable and Integrated
CIS is an integrated member of the UC Chemical Suite of applications and utilizes the Core Services application as the centralized publishing point for buildings and rooms on each campus delivered via web services for use within CIS. CIS will also integrate with other systems within the UC Chemical Suite to share the chemical library.

Administrative and Cost Efficiencies
By leveraging the power of implementing one system for all 10 UC campuses, the project achieved over 75% discount from the licensing fees of the system. In addition, the system is deployed centrally at the San Diego Super Computing Center and managed by one team. This resulted in similar savings in resources to maintain the system as well as improving the security and availability of the system for all 10 UC campuses.

Technology Used

Authentication/Framework
• CIS/CBIS implements UC Trust, the UC Federated Authentication Framework. All users will be directed to the UC Trust login interface, and the returning UC Trust user data will be used to cross-reference the successful login to a CIS account.
• New users will be added through UC Trust data, which will require a new user to be approved by each Campus EH&S Administrator.

CIS is an Enterprise class software
CIS/CBIS is a mission-critical application in a host of regulatory environments; from government to industry to academia. It has a history of delivering:
• 99.9% availability
• Highly scalable
Highly portable - CIS is OS and Database vendor agnostic. Recommended installation: Linux/Apache Tomcat/PostgreSQL

System supports the following client user platforms
CIS is a web-based application that is OS and Browser independent. It requires no plug-ins or the installation of any additional software.

System is designed for the web
- CIS renders standard html to the client
- CIS can integrate existing cascading style sheets

Documentation allowing
CIS provides multiple levels of technical troubleshooting:
- An error log in the database stores all exceptions. This error log is searchable on the web from the application and provides the logged in entity and error message, stacktrace and timestamp.
- All application events are sent to the Tomcat log. Verbose logging can be activated which can then output to the log everything from sql statements to Java object attributes.

The product schema is a non-prescriptive database that stores metadata. A metadata-based schema provides a flexible, extendible and customizable framework.

Hosting and Installation
- CIS can be installed on a single Tomcat instance.
- CIS is separated into distinct “Enterprises” representing each campus. Each enterprise has its own System Administrator, Roles and Entities. Each enterprise also has its own metadata constructs. This allows CIS to fully encapsulate the data from each campus and make it independent of the others. Shared XML identifiers across enterprises allow for global searching and reporting.
- CIS supports a family of Data Transformation Services (“dts”) that can extract from - and post to - external data sources. Methodologies exist to define the external datasource; its connection parameters, schema (including relational dbs and constraints), field mapping attributes and transformation frequencies. The dts supports one and bi-directional data flows, transformational deltas, data type conversion parsers and robust dts logging. Dts can be initiated through direct jdbc calls or through a web service.
- There are two instances of CIS installed. A production environment listening on port 80/443 and a test environment listening on port 8080.
- CIS is hosted and managed at the San Diego Super Computing Center.

Project Timeline
CIS was developed by the vendor, eCompliance, and the timeline to implement CIS/CBIS to all UC campuses was prioritized by the CIS Functional Workgroup. The first campus to implement was UC Merced in September 2013. Subsequently, UC Los Angeles, UC Santa Barbara, and UC Santa Cruz rolled out the system. UC Davis is hoping to go live in May 2014 followed closely by UC Riverside. UC Berkeley is planning for implementation in August 2014 and finishing up the year with UC San Diego, UC San Francisco, and UC Irvine. The CIS Functional Workgroup is focused on meeting the critical deadline of December 2014 to allow all UC campuses to have the functionality to meet mandatory year-end reporting deadlines.

Customer Satisfaction Data
As each campus has implemented the CIS/CBIS system, we have received very valuable direct user feedback from the System Administrators, as well as the campus end-users and worked with the vendor to implement this feedback.
Direct Customer Quotes

“I’ve found that IT Services and eCompliance always do their best to accommodate the many and varied requests from all the UC campuses to change and/or improve CIS. Thanks!” Daniel Keck, Senior Laboratory Safety Officer, UCLA Office of Environmental, Health & Safety

“It is wonderful to have the opportunity to leverage data from other resources (other campuses, Sigma-Aldrich, and eCompliance) to increase efficiency and the quality of end work product. Thanks!” Karen Smith, CSMM, CCHO, ARM, Laboratory Safety Specialist, UC Merced Office of Environmental Health & Safety

“The new Chemical Inventory System developed for the University of California is a fantastic application. It is easy to use and greatly simplifies maintaining compliance with the chemical inventory regulations.” Justin Delemus, Environmental Programs Specialist, UC Santa Cruz EH&S