Transworld Data Case Study

Tongji University Assumes a Leading Role in System z Enterprise Education

Founded in Shanghai by Dr. Erich Paulun as the Tongji German Medical School in 1907, Tongji University http://sse.tongji.edu.cn became a state university in 1927 and has gone on to become one of the most prestigious institutions of higher education in China. The name "Tongji" means "cooperating by riding the same boat." Tongji University has done exactly that by partnering with local enterprises to develop one of the finest enterprise technology education programs in China.

"The large market demands for System z talent convinced us to develop an enterprise education program centered around System z technology," said Dr. Zhen Gao, Director of the IBM Technology Center, School of Software Engineering, Tongji University. "The Enterprise Computing on System z program has already turned into one of dominant majors in our School of Software Engineering. The curriculum is very popular with students. Students recognize that actually learning System z knowledge enhances their job opportunities in the top Fortune 100 international companies."

Developing an Enterprise Computing Program

Tongji University launched its enterprise mainframe program in 2005. It has been offering mainframe courses to students in its software engineering school ever since. Today, the university offers 13 different mainframe courses to undergraduate and graduate students.

"Many common and significant IT technologies such as virtual storage, I/O channels, SQL, transaction and cluster concepts, etc., were initiated on the System z platform," said Dr. Gao. "The curriculum of System z gives students opportunities to touch the live cases of these technologies. This helps students to understand abstracted theory in a direct and easier way. We hope the curriculum can include more cutting-edge technology related to System z, and a Chinese curriculum version is also expected in the future."

Central to the success of Tongji University's enterprise technology curriculum has been the direct involvement of IBM. "IBM made key contributions that facilitated the success of the curriculum," said Dr. Gao. "The System z hardware and software that we use were donated by IBM. Our instructors are also able to get a lot of training conducted by IBM System z experts every year free of charge. We recognize that our enterprise technology curriculum could not have been successfully set up and promoted without IBM's tremendous support."

Simulating the Enterprise Technology Experience

What differentiates Tongji University's enterprise curriculum from many other university programs is that students actually work on an enterprise-level banking system platform to develop their System z skills. The system, known as "Minibank," contains a full set of banking functions embodied in the software and running on System z.

"Minibank is a prototype of a core banking system that runs on the mainframe," said Tongji enterprise computing lecturer Min (Amy) Wang. "It encompasses most of the functions that support a core banking system in a simplified way, including employee management, customer management, account management, deposits, loans, foreign exchange supports, interest calculation software, option trading, resource management and system management. The system supports 24/7 transaction processing."

Now teaching mainframe-related courses full-time at Tongji University, including topics like large-scale business databases (with DB2 for z and IMS), Wang was formerly a software engineer with Citicorp Software and Technology Services, Ltd., in Shanghai. While at Citicorp, Wang was responsible for researching and developing core programs powering CICS transactions. "After I left Citi to join Tongji, I led a team of 13 Tongji students to start developing the Minibank project in mid 2006," said Wang. "When the system was initially released at the end of 2006, the project won various national competition awards."

Since then, Tongji University students have added enhancements and new functions. These include bulk transaction simulation and stress testing, data mining and BI (business intelligence) studies on transactional data, and multi-tenancy for cloud support on System z. Although they cannot access the software code, other universities in China are able to use this software freely in their business curricula by signing onto a Tongji University mainframe account.

Originally developed on System z, Minibank has run on the mainframe ever since. "With Minibank, we wanted to create a prototype of a core banking system on System z that students and faculty could use for teaching and researching," said Dr. Gao.

Tongji University students are the developers and project leaders of the Minibank project. "Students have been working wonderfully with Minibank, since the first release of the software," said Dr. Gao. "The Tongji team demonstrated its creativity and team work to complete a complex project while learning new technologies, and each year students are adding new and innovative functions to the project, including disablility aid (with voice and motion detection), mobile banking, ATM safety protection, bulk transaction simulation and stress testing, data mining and BI on transactional data, multi-tenancy and cloud support. They can't wait to try out their ideas and technologies on this virtual banking system, which makes the project quite interesting."

In addition to the productive work that Tongji students have achieved with the Minibank project, the university's enterprise and System z curriculum has enhanced Tongji's academic and research reputation.

"Many academic papers related to mainframe technology have been published by our professors and students over the past five years," said Dr. Gao. "Among them, there are 11 EI indexed papers which refer to multi-tenancy technology, performance tuning of System z database, SOA, data mining and BI, cloud computing on the mainframe, etc." The work has been instrumental in building awareness of System z in the academic community throughout China.

Building a System z base in enterprise curricula in China is extremely important. Currently, IBM is the primary provider of System z training to private enterprises in China, but with the growth of System z enterprise curricula in Chinese universities like the University of Tongji, it is likely that Chinese universities will assume a larger role in this education in the near future.

Student Preparation for Enterprise Employment

Each year, there is an average of 200 students at Tongji University who enroll in mainframe courses. The average class size is 30. Annually, around 20 students complete their mainframe study programs. These students receive internships from enterprises in mainframe-related positions, and most of them are hired after they complete their internships.

"I have been a student at Tongji University for three years," said Guo YiLiang (Glorabit). "My course of study has included the mainframe operating system, database systems, programming languages, middleware, system management and application analysis."

Before Guo began his Enterprise and System z courses at Tongji, he was relatively unacquainted with mainframe technology. "We needed to choose a major during the second year in college, and I took some time to do research and find more information about mainframe technology and about the future of the mainframe," said Guo. "I was amazed at the long history behind this technology, and how large a role that the mainframe plays in major enterprises. This was a turning point for me. It was instrumental in my decision to focus on mainframe technology."

Now in his fourth year of study, Guo is engaged in a project where students are developing a cloud platform on System z. "This project's goal is to share mainframe education resources with anyone who wants to study mainframe technology," said Guo, who will shortly be starting an internship with IBM CSTL focused on mainframe system tools development.

Does Guo believe that his System z coursework at Tongji helped him to get prepared for the enterprise job market?

"We have access to so many resources from our System Z courses and also from IBM labs," said Guo. "All of this helps us get prepared for our internships and future employment. Understanding the System z environment is very helpful, because many people know Java and some general technology--but fewer of them are trained in mainframe technology. This makes students with mainframe skills highly sought after by enterprises."

Linking the University with Enterprises

Committed to assuming an active role with Chinese enterprises, Tongjj University goes well beyond educating students and setting them up for internships and employment. The university also actively collaborates with businesses through CDUG cdug.tongji.edu.cn; the Greater China Enterprise System z User Group. "As the host to CDUG, Tongji is organizing CDUG conferences, running the CDUG website and managing CDUG networks," said Min Wang, who assists Tongji as it functions as a focal point for CDUG. Established in 2007, CDUG is focused on System z. The System z core competencies it emphasizes are z/OS, CICS, IMS, DB2 and DB2 tools. CDUG now has over 200 enterprise members from China, Taiwan and Hong Kong. The organization promotes active project and idea collaboration between enterprises and between enterprises and universities. Its members span most industry verticals, including transportation, banking manufacturing, services and government.

"I started to work with Tongji University in 2009, when I joined the DB2 for z/OS team as development manager," said Wei (Martin) Jiang, Manager of DB2 for z/OS Development at IBM's China Software Development Laboratory-Information Management. "We gave guest lectures to students at the university, and we also met with students, and offered internships and permanent employment opportunities."

The Software Development Laboratory's collaboration with Tongji was an active one that allowed IBM managers to get to know and develop relationships with both faculty and students. "One program we collaborated with the university on was the Visiting Scholar program, an IBM Academic Initiative offering," said Jiang. "In this program, three Tongji University faculty members participated and visited IBM's office in order to develop an enterprise mainframe curriculum. Our next step was to again work with Tongji to develop a mini core banking system which would provide university students with hands-on skills development in DB2 for z/OS application development and performance tuning. In our newest collaboration, we are working with Tongji in Shared University Research, an IBM University Relationship program. Our developmental focus in this program is System z Education in a cloud computing environment."

Jiang said that IBM's China Software Development Laboratory continues to take an active part in collaborating with Tongji University in curriculum development for enterprise computing and the mainframe. "Our working relationship with Tongji University focuses on moving forward with some of basic System z skills development, and this is done by correlating course content with on-the-job internship and permanent

employment requirements," said Jiang. "By actively cooperating and exchanging ideas with the university, we feel that this benefits both Tongji and ourselves. We are delighted that the university has already initiated a series of actions to implement the educational concepts we have discussed."

Today, Tongji's enterprise System z curriculum is structured around application development and system administration. Building block system administration courses include:

- Fundamentals of z/OS System Management;
- Database Administration;
- Z/OS System Programming;
- Mainframe Storage Management (SMS); and
- Mainframe Security Control (RACF).

Application development courses include:

- DB2 Application Developing;
- Fundamentals of Hierarchical Databases; and its centerpiece;
- A Case Study of the Minibank Mainframe Banking System;
- Query Optimization and Performance Tuning;
- Enterprise Computing and Service Engineering.

The program is supported by six fulltime professors, three visiting professors—and computing assets that include an IBM z900 mainframe, an IBM AS400 minicomputer, IBM P series servers, and systems software that includes DB2 and CICS.

In the past, IBM engineers have delivered several courses to Tongji University students, addressing subjects in the areas of emerging technology, hands-on skills training and real-life project development. The university is also extending its course offerings to add courses in DB2 Administration, IMS Systems Administration and DB2 Query Optimization. "In the future, I also hope to see industry solution-related content in Tongji's educational offerings," said Jiang.

Jiang said that Tongji students with one to two years of System z training were often eligible for internships and permanent employment, and that many assumed positions as engineering assistants in the area of work efficiency improvement; technology research prototyping and educational pilot project development. "In all of these areas, we have been pleased with the skills and the dedication that Tongji students bring," he added.

"In my personal experience, what makes Tongji so unique in its approach to enterprise education is its enthusiasm to collaborate with enterprises in the development of educational programs that really meet the needs that enterprises have," said Jiang. "The university is always proactive in taking collaborative actions. It has also made a significant investment in System z education that goes all the way down into the system's infrastructure. Courses have been developed at Tongji to support this, and Tongji students

also have hands-on labs. Just as important, Tongji faculty has the in-depth knowledge needed to teach these courses."

Morgan Stanley has also actively partnered with Tongji University's enterprise education program over the past two years. "Tongji's Mini-bank project simulates a "real life" banking platform. This is an advantage to us since we are a financial services firm," said Vice President Alvin Yeung, whose focus is enterprise infrastructure.

Morgan Stanley is another enterprise partner that provides internships and employment to Tongji students. "We always want to get the top talents to join our firm," said Yeung. The partnership with Tongji allows us to have first hand information about and access to those top student talents. This places us in a better position for getting them to join us."

Concluding Remarks

With its System z enterprise technology program and its active collaboration with enterprises to address workforce knowledge needs, Tongji University has remained true to its namesake of "riding in the same boat." The university continuously tunes its curriculum to the demands of the enterprises in China that it partners with. In turn, these enterprises partner with Tongji in curriculum development, providing students with internships and permanent employment.

Tongji has also inserted itself into the enterprise picture by hosting the China Enterprise System z User Group.(CDUG), which actively promotes collaborative research and projects between the university and CDUG members. It comes as no surprise that Tongji University was voted an IBM "Best Educational Partner" three times.

"There are many good universities in Shanghai and China," said Morgan-Stanley's Alvin Yeung, "But to me, Tongji stands out from the rest in the study of System z and the enterprise."