HOUSE RESEARCH ORGANIZATION

focus report

Texas House of Representatives

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The Year 2000 Computer Problem: Texas Seeks Antidote to the Millennium Bug

The 75th Legislature appropriated more than $110 million for fiscal 1998-99 to remediate a universal computer software glitch known as the year 2000 problem or the millennium bug. The problem developed from early programming shorthand that used only the last two digits of a year. Thus, a computer would interpret references to the year 2000 as 1900. Left uncorrected, this programming error will cause data reporting problems and could lead to wholesale shutdowns of entire computer systems. Furthermore, the problem extends beyond computers to any equipment that has an "embedded" date-calculating computer chip, including fax machines, elevators, and power plants.

Texas state government depends on computers for much of its day-to-day operations. Computers have become essential for checking criminal or driving records, accessing court dockets, collecting and transferring tax revenues, processing child support payments, depositing state employee paychecks, and a host of other activities. Some of these tasks could be accomplished without computers, but computerized processing allows them to be performed much more quickly and with much less manpower.

Rep. Dan Kubiak, chair of the House Appropriations Subcommittee on Major Information Systems (MIS), says there is no reason the state should not be fully ready for the year 2000 as both ample time and money are available to correct the problems. Department of Information Resources (DIR) representatives have told the MIS subcommittee that current plans allow for remediating nearly all mission-critical systems by the end of 1998 or early 1999. Nonetheless, the lack of skilled personnel is hampering efforts to make timely corrections to computer systems, and deadlines for action may be much sooner than anticipated.

Estimates of how much Texas must pay to fix its year 2000 problems vary. The $110 million appropriated by the 75th Legislature does not include employee costs but does allow for hiring outside contractors. An IBM assessment of the state's year 2000 needs estimated costs at $200 million, including staff expenses for state agencies but not institutions of higher education. Neither figure covers the cost of testing and fixing embedded systems also susceptible to the millennium bug.

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Representatives of the Department of Information Resources (DIR), the agency in charge of overseeing necessary changes to state computer systems, told a January 26 hearing of the MIS subcommittee that a report conducted for it by IBM found a number of key issues that could affect the ability of the state to resolve year 2000 problems. These issues include not only high vacancy and turnover rates for information personnel but also the impact of embedded systems, the need for additional funding, and the status of other entities with which the state shares information, including federal agencies, local governments, and business entities. (The full report is available on the Internet at www.dir.state.tx.us/y2k/.)

Universal Problems Posed by

The year 2000 problem, or in computer shorthand "Y2K," originates from an old computer programing shortcut that designated dates by using only the last two digits of a year. For example, January 12, 1987, is logged by the computer as 011287. This space-saving notation causes problems when a computer logs a date occurring after December 31, 1999. A date record from January 12, 2000, would be recorded as 011200. A computer asked to sort these two examples will assume that 011200 comes before, not after, 011287, making the later record essentially one from 1900.

Programers removed the century digits, currently "19," in order to conserve computer storage space that originally was at a premium. Although two mere digits may not seem to require much storage space, the amount of aggregate space freed is significant. Most mainframes hold hundreds of thousands of records, and dates may be recorded multiple times for various records. The programers who originated this system also believed that these programs would be rewritten or replaced long before the turn of the century. While many programs have been changed, the base code used in many older programs was simply copied into newer versions in order to save time.

The solution to the problem seems easy enough: simply change the programs so that they log four-digit years. Herein lies the rub: most of the computers acutely affected by the millennium bug are large mainframe computers that run complex systems. Unlike personal computers, for which software can be updated simply with a new version of the program, mainframe computers run on software that was custom-written for the organization and the application involved. Most of these programs were written in cumbersome computer languages that are as foreign to today's software developers as ancient Greek.

The fact that each program was custom-written — and probably updated by scores of different programers over the life of the system — means there are no standards for the programing language, no shortcuts that would allow a programmer to simply look for and change every occurrence of the "date" variable. Dates may be represented by other variables, such as value and time. For example, an insurance policy could be coded as HG45-031765-56TR4, with the mid portion of the code signifying the date on which the policy became effective, in this case March 17, 1965. A programer would have to examine the computer code line by line in order to determine whether or not a number represented a date. These computer languages used massive amounts of code, often millions of lines of code per program, making modifications very time consuming and costly.

Personal computers are also susceptible to year 2000 problems even if all of their software is Y2K-compliant. Most personal computers contain an embedded system that holds the date and time and serves as the Basic Input/Output System, or BIOS, necessary for even fundamental computer on/off functions. Many BIOS systems installed before 1997 are not Y2K-

Furthermore, some agencies have not fully cooperated with DIR in reporting on the progress of their internal efforts. Under HB 1, the General Appropriations Act for fiscal 1998-99, Art. IX, sec. 188, all agencies and higher education institutions are required to file reports with DIR as requested. Less than half of the nearly 200 agencies or institutions had filed the required reports as of the Janunary 26 MIS subcommittee hearing. Rep. Kubiak said the MIS subcommittee will meet every two to three weeks to monitor the state's year 2000 efforts. He expressed concern with the low response rate for DIR reports and warned that any agency that failed to turn in its reports in a timely manner would be called before the subcommittee to explain that failure.

At least five agencies that have filed reports were classified by DIR as being at-risk for not finishing critical applications in time. These include the Department of Public Safety, Office of the Attorney General, Texas Department of Criminal Justice, Teacher Retirement System, and Texas Department of Health. All five agencies appeared before the MIS subcommittee to explain their at-risk classification and delineate the steps they were taking to ensure year 2000 compliance. The five assured the subcommittee that their efforts would be completed on time.

DIR anticipates that a number of noncritical systems will not be fully converted by January 1, 2000, in part because the department lacks authority to require agencies to spend time and money to fix the problem. It can extend appropri-

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compliant, and even some computers sold today contain an older version of BIOS. Some of these computers may boot up properly after January 1, 2000. Others may return incorrect data to programs requesting date information; still others will not work at all.

Some versions of BIOS may be upgraded with a software program. Others may require replacing the computer's entire motherboard, the main piece of equipment to which all devices, including storage and memory, are connected.

Embedded systems

The year 2000 problem extends beyond computers to numerous pieces of everyday equipment. Technology requiring scheduled maintenance — such as elevators or medical equipment and even fire engines and buses — now often contains a built-in computer chip to record service dates and prevent the device from working if too much time has elapsed since the last service. After December 31, 1999, many embedded chips will missort a current date ending in 00, consider that the device has never been serviced, and shut down. Embedded chips are also found in many complex systems, from water and wastewater treatment facilities and PBX phone systems to utilities, including nuclear power plants. They even control the doors for many prisons and bank vaults.

The Y2K problems generated by embedded chips are superficially easy to fix: simply replace the chip with a new one supplied by the manufacturer. However, this job is often time consuming, especially in large enterprises like state government, since all affected systems must be inventoried and new chips ordered and installed before the deadline.

The embedded systems issue is compounded by a number of other factors. First, most people do not understand that this also is a year 2000 problem. Attention to the millenium bug has focused on computers, not chips in machinery. Second, embedded systems are usually not under the supervision of the information systems department that handles computer conversions, and often those in charge of the embedded systems do not know the extent of the problem even in companies otherwise well aware of Y2K problems.

Furthermore, new equipment bought today is not always guaranteed to be Y2K-compliant. The accompanying warranty must stipulate such compliance. And even if compliance is warrantied, all new equipment, especially devices that affect public health and safety, should still be tested. Additionally, embedded chips are not always standard equipment. In two otherwise identical devices from the same manufacturer, different chip models may be embedded.

ated funds to agencies only after they have completed assessment reports and indicated the level of effort needed to correct their problems.

DIR also lacks authority to prevent agencies from pursuing other information systems projects pending resolution of year 2000 issues. Several officials testifying before the MIS subcommittee stated that their agencies were voluntarily refraining from devoting any resources to any other new computer-related project; Rep. Kubiak posed the question of whether the Appropriations Committee has authority to enforce such a rule statewide. In California and New York, agencies have been prohibited from making any non-year 2000 related information systems enhancements.

The potential for failure of certain systems makes planning essential, witnesses said. Many Y2K planners suggest companies develop contingency plans for continuing business operations in the event of problems. The recent UPS strike showed that businesses that had planned for disruptions were better able to keep their operations running. The impact of that strike, however, could pale in comparison to the disruptions that potentially could result from year 2000 problems. Even businesses that already have completed their remediation efforts should have contingency plans because new or reprogrammed systems may not always function as expected once they are finally put into use. Furthermore, organizations may be affected by the remediation efforts of critical partners with whom they do business or

or exchange information, from shippers and outside data processors to customers. The DIR has asked state agencies and higher education institutions to develop such contingency plans.

On the positive side, the MIS subcommittee learned, Texas has already tallied a number of year 2000 conversion successes. These include substantial efforts at the Texas Department of Insurance and Texas Banking Department not only to convert their systems but also to ensure that the industries they regulate are prepared for the millennium. The banking and insurance industries are highly susceptible to year 2000 computer glitches because the information they rely on is date-sensitive and highly automated. Both agencies explained that they were prepared to use their regulatory authority to ensure that the industries under their purview were prepared for the year 2000 by, for example, requiring Y2K progress reports and checking compliance during regular and special visits. The agencies said they also would use their regulatory authority to minimize the impacts on consumers that could develop if an insurer or bank failed to remediate its problems in time. Officials of the two agencies agreed that executive leadership is crucial in setting and following an agenda that makes year 2000 problems a priority.

Staffing issues

The lack of skilled and experienced information systems personnel is affecting all agencies as well as private-sector organizations trying to remediate the millennium bug. Witnesses testified that numerous information systems positions with the state are vacant. Others have been filled with qualified people who, however, lack experience with the particular agency's systems. When remediating information systems, system experience can save money and time. Mary Lauderdale of the Texas Department of Public Safety (DPS) explained how an experienced programmer saved DPS from having to remediate one system by simply requesting different data on a form. Instead of asking for a birth date and converting that to an age, the form now asks for age directly, avoiding the problem. This simple solution might never have been considered if the programmer had been unfamiliar with the system.

The state is experiencing increasing difficulties in retaining experienced information systems personnel. The 75th Legislature approved bonuses of up to $10,000 for designated employees who remain to resolve year 2000 issues. Bonuses, however, must come out of the agency's own budget; no additional money was appropriated for this purpose. Witnesses before the MIS subcommittee explained that while bonuses help, many experienced information systems personnel are leaving for private sector positions that pay as much as twice their current salary. Other state computer professionals, limited to one pay increase per year by any one agency, are hopping between agencies, receiving substantial salary hikes each time they move.

If the staffing situation worsens, the state will have to rely even more on outside contractors to remediate year 2000 problems, a development that could substantially increase costs. Even with state employee benefits factored in, contract workers often cost as much as 40 percent more than regular state employees. Furthermore, some contract workers are former state employees. The fact that they are receiving much higher pay as they work alongside their former colleagues undermines the morale of state employees, according to witnesses appearing before the subcommittee. They recommended a number of changes in employment practices: significantly increasing base pay, allowing merit raises more than once per year, permitting state employees to work overtime for pay, and recruiting retired employees to work part-time. Subcommittee members said they were open to examining methods for giving agencies additional flexibility in retaining staff.

Deadlines for action

Observers disagree about the real deadline for completing year 2000 remediation efforts. Most experts hold up a target date of December 1998 in order to allow a full year of testing and on-line debugging. Planning, testing and debugging all are crucial tasks in modifying computer systems, witnesses said. For example, the Attorney General's Office was criticized for delaying implementation of its new child support computer system and accused of "over-testing." However, even with the extensive testing, additional errors were discovered when the system was actually put on-line.

Some computer systems must be completely remediated ahead of January 1, 2000. A prime illustration is the state's financial software, which must be ready in advance of the fiscal 2000 start date of September 1, 1999. Other systems that require advance

Local Developments

Cities and counties

Cities and counties in Texas seem unaware of the extent of the year 2000 problem, witnesses told a January 22 meeting of the House Urban Affairs Committee. Representatives from the cities of Austin and Killeen, the Texas Municipal League, and DIR said that cities lacking mainframe computers seem to feel that they do not need to worry about the issue. However, nearly every city has some type of computer that may need upgrading, including BIOS upgrades on personal computers. More importantly, many cities run date-dependent systems, including billing for utilities, setting municipal court dockets, and scheduling for parks. These systems are at risk of falling prey to the millennium bug. Also at risk are embedded systems used to operate jails and water or wastewater facilities and manage utility services.

Committee members expressed concern over the dearth of cities responding to its request to discuss year 2000 issues and invited the Texas Municipal League to join in a concerted effort to make cities more aware of the extent of the problem and the need for corrective action. Representatives from the DIR Year 2000 Project Office also will join the committee as it travels around the state to publicize the seriousness of the year 2000 issue.

The House Urban Affairs and House County Affairs Committees are charged with monitoring the year 2000 efforts of cities and counties, respectively.

School districts

Schools and school districts will likely face some level of year 2000 problems. Systems that may be affected include district computers that run financial calculations and handle registrations and enrollment and student computer labs. Such labs are especially susceptible to problems because much equipment has been donated and is often much older than systems now used in business and government. Older computers are more likely to have personal computer BIOS issues requiring expensive upgrades. The Texas Education Agency is making efforts to ensure school districts are aware of the problem, but each district will need to budget appropriate amounts to remedy problems and find information systems personnel to complete remediation.

planning need to be ready even sooner: for example, cities often make computerized reservations to use local parks up to a year in advance. Institutions of higher education, in particular, should be well into remediating year 2000 issues by now because their registration systems often must input dates several years in advance. Depending on the institution, the millennium bug also may affect administrative systems, including payroll; academic systems, such as computer labs; and physical systems, such as the physical plant or sprinkler systems, all of which entail date calculations.

Complicating the timing issue of year 2000 problems is the uniqueness of the year itself. The year 2000 is a leap year, an odd occurrence that even now causes problems for many computer systems. Additionally, January 1, 2000, falls on a Saturday, so it may be several days before organizations realize the full extent of the fall-out from the millennium bug. Some entities have begun to plan for extended shut-downs around this date. The Securities Industry Association, for example, has proposed closing stock markets on Friday, December 31, 1999, in order to perform computer-related repairs. Other institutions will likely consider closing December 31 and Monday, January 3, to ensure their systems are working properly.

— by John J. Goodson

Selected Resources

Texas Year 2000 Project Office
Information on the project office, agency and university reporting to DIR, Y2K legislation in Texas and other states, and articles covering many different Y2K issues, including banking, embedded systems and litigation.
http://www.dir.state.tx.us/y2k/

Year 2000 Information Center
Web site founded by Peter de Jager, regarded as one of the foremost experts on Y2K issues, with articles about the national and global scope of Y2K problems.
http://www.year2000.com/

Yahoo! Year 2000 Problem News Coverage
Daily updates on Y2K news stories and links to web sites, other news sources and message boards.
http://headlines.yahoo.com/Full_Coverage/Tech/Year_2000_Problem/

Year 2000 Bookmarks
Comprehensive list of internet resources related to the Y2K problem, updated at least weekly.
http://www.netcom.com/~ggirod/bookmark.html

Year 2000 Information Directory
Federal government information from the General Services Administration.
http://www.itpolicy.gsa.gov/mks/yr2000/y201toc1.htm

Higher Education
Texas A&M — *http://www.tamu.edu/cis/teams/yr2k/*
University of Texas — *http://dpweb1.dp.utexas.edu/dpyr2k/*

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