





ELECTRONIC ENGINEERING

# Constant innovation

Electronic voting machines with a digital identifier start being used in the 2008 municipal elections

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In the second round of this year's presidential elections, exactly two and a half hours after the conclusion of voting, the electors were officially advised by the Supreme Electoral Court (TSE) that candidate Luiz Inácio Lula da Silva had been reelected. The speed in the tallying of the votes where almost 102 million electors took part is due to the electronic voting machines, which, after ten years of use, have become part of the Brazilian electoral culture. "Even in indigenous villages that do not even have a telephone, the voters know how to vote on an electronic voting machine", says Giuseppe Janino, the TSE's Secretary for Information Technology. Now the voting has ended, another innovation is already under way that should improve the next elections. They are machines containing a biometric reading device that makes the automatic recognition of the elector possible by means of his or her fingerprint.

The biometric readers have now been put into 25,538 machines purchased for the 2006 elections and forwarded to the states of Mato Grosso do Sul, Rondônia and Santa Catarina. This time, they were used as traditional electronic voting machines. The expectation is that in the 2008 municipal elections the voters in these three states, instead of signing to confirm their presence, will put their fingers into an identification reader. For this to happen, a register of the voters' fingerprints has to be

made beforehand in the TSE's computers, as well as adjustments to the database software. "The digital recognition technology has the objective of guaranteeing more security in the identification of the voters", says Janino.

The tendency is for all the voting machines, in the near future, to have biometric readers. The innovation will be incorporated in stages, as with the electronic voting machines, which in 1996, when the computerized voting system started, covered only municipalities with over 200 thousand voters. In the second stage, in 1998, it was the turn of cities with 40,500 voters to adopt the new technology, which reached the whole electorate in 2000.

**Knowledge transferred** - The success of the Brazilian electoral process has resulted in various collaboration agreements with a few countries, mainly from South and Central America. Brazil has now made knowledge and technology transfer agreements with Argentina, Ecuador, Costa Rica, Dominican Republic and Mexico", Janino says. In the municipal elections held in Paraguay in November this year, the technology used was entirely Brazilian. The TSE lent 17 thousand voting machines that were out of use, and gave all support for the development of the software, allowing 3 million Paraguayan voters to choose their new mayors by means of electronic voting machines. In the 2003 presidential elections, the neighboring country had already used the Brazilian technology, carrying out a 50% computerized ballot.

But not only the neighboring countries are interested in the Brazilian electoral process. The Electoral Court has now received the visit of representatives from about 30 countries, who came to get to know the technology developed here, including Germany, Japan, Italy, France, South Korea and the United States.

The process of computerizing the vote in Brazil began in 1983, when the Electoral Justice authorities organized the computer infrastructure that interlinked all the Regional Electoral Courts (TREs) and the electoral registry offices in the country. The system was used in the electronic re-registration of the Brazilian electorate in 1986, in the tallying of the results of the presidential

election in 1989, in the national plebiscite on the form of government in 1993, and in the 1994 general elections. The first public bidding process for the acquisition of electronic voting machines started at the end of 1995. Three companies took part, and the winner was Unisys, which delivered to the TSE the first 77 thousand electronic voting machines manufactured in Brazil.

An electronic voting system is a set of hardware and software made up of two modules: the voter's terminal, or electronic voting machine, which includes all the information processing and storage capacity, and the microterminal used by the election judges. The connection between the two modules is made by a cable connected directly to the internal boards. The electronic voting machine, which weighs a little more than 8 kilos, has a numerical keyboard and a small liquid crystal monitor. Its architecture is similar to that of a personal computer, but the project provides for highly differentiated hardware, which includes, for example, sensors for checking the internal battery and the printer, and a microcontroller used to control the sensors and the keyboard of the voter's terminal.

The product contains a series of principles that ensure security for the process, such as passwords, encrypted information and security methods used in banking automation that reduces to a minimum the possibility of electronic fraud. In 2002, a team of specialists from the State University of Campinas (Unicamp) did an evaluation on the security of the electronic voting machines at the request of the TSE. At the study's conclusion, some recommendations were made to improve the security, but no item was pointed out that might put into question the reliability of the system.

**Public tender** - Since 1995, six public tenders have been held for supplying the electronic voting machines, two won by Unisys and four by Procomp. "We basically have one model of voting machine for each election", Janino says. This occurs because the voting machines are constantly updated and perfected. In the 2000 model, for example, the voting machines were given an audio device by means of which, using headphones, the visually impaired can hear a confirma-

tion of the numbers keyed in on the keyboard, which also has identification in Braille. And they also gained autonomy for working for over 12 hours without external power. The Brazilian electoral court administration currently has over a hundred large sized computers installed in the TSE and in the 27 TREs, about 18 thousand desktops at the 3,009 electoral zones and 407,089 electronic voting machines.

The tranquility of the electronic voting that re-elected Lula in October 2006 contrasted with various incidents recorded one week after the elections in the United States. In the ballot held at the beginning of November to renew the legislative positions and to choose 36 governors, voters in the states of Indiana and Ohio and some of those in Florida had to vote with paper ballots instead of using the electronic voting machine.

Specialists point out that the population lacked experience, since one in three voters was using the machine for the first time. Furthermore, in some counties the election judges were not prepared to use the equipment. There, each county is responsible for the election under its jurisdiction, while in Brazil it is centralized and unified for the whole national territory.

They are two distinct realities. Here, there is the organizational structure of the Electoral Courts authorities, with the TSE as the highest authority and well-defined duties. As soon as the elections end, an evaluation of the process is made, based on the records of difficulties encountered. And the planning for the next elections is starting immediately. "We work in a process of ongoing improvement, not only with regard to the equipment, but in particular as to the procedures", Janino explains. "The great success of our computerized process, which is today a world benchmark, is not simply focused on the electronic voting machine tool, but rather on a well drawn up and concatenated process that aims at guaranteeing the security and the transparency of the process", he says. The interesting thing is that the first Brazilian Electoral Code, in 1930, already provided for a voting machine as a resource for cleaning up the electoral vices and guaranteeing fraud-free ballots, an intention that, awaiting technological advance, took a few decades to become reality. ■