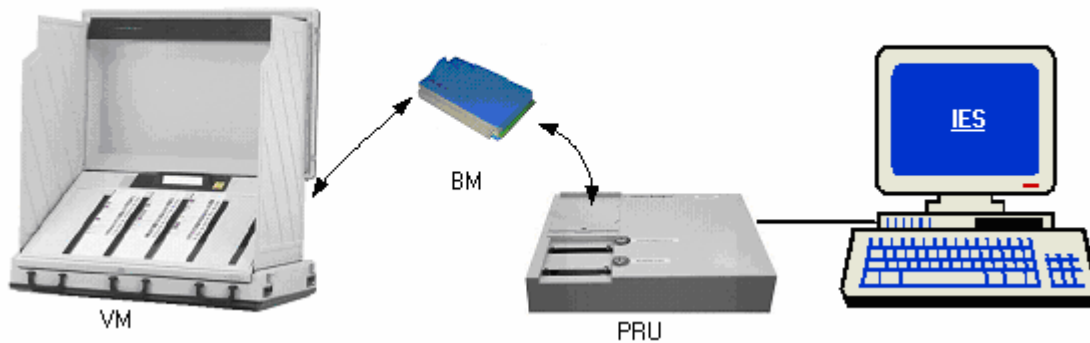


Appendix 3

Technical Description of the Chosen system

Technical Description of the Chosen System⁷⁷

1. The Powervote Electronic Voting System



This consists of:

- A Voting Machine (VM) Powervote ESI2, which is also the polling booth, has paper ballots as the user interface inserted into the voter's panel of the voting machine. This allows voters to select their preferences by pushing buttons for candidates or options, while keeping a full overview of what they have selected and still can select.
- A Ballot Module (BM), where the election configuration is programmed in with security checks via PRU and the IES software and that is placed in the VM before the election and where the votes cast are stored redundantly with security checks.
- A Programming and Reading Unit (PRU), connected to the PC to allow for communication between PC and Ballot Module. The PRU also verifies the correctness of the election configuration.
- Integrated Election Software (IES), that runs on a PC. This is used to define polls for all electoral areas. IES is responsible for configuring the ballot modules and providing the correct information for printing the ballot paper overlays for fitting to the voter's panel of the voting machine. At the close of polls IES reads in the vote data from each ballot module, carries out the count and tabulates the results.

2. The Electronic Voting Machine Powervote ESI2

The Voting Machine consists of three main parts:

- The voter's panel, with up to 5 ballot paper overlays, with membrane switches underneath each candidate or option. Next to each ballot paper there are LED displays that show the order of preferences of the voter when candidates or options are selected. An LCD display presents instructions to the voter and shows the name of last selected candidate or option to the voter. The voter uses the Cast Vote button to cast his/her vote.

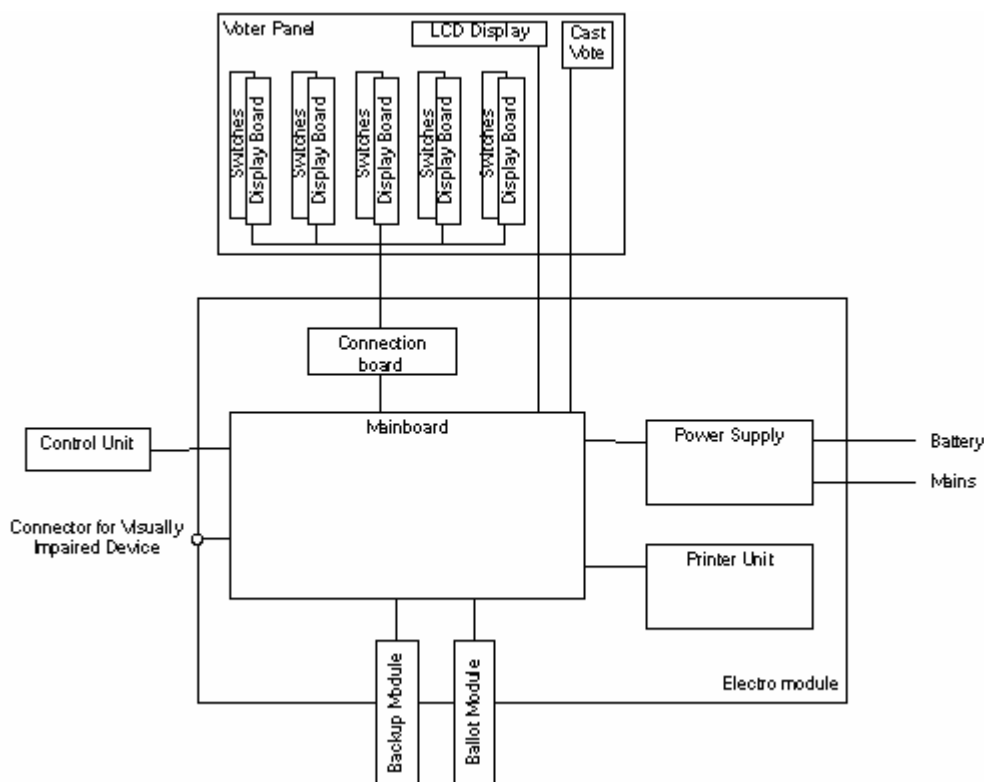
⁷⁷ Source: Nedap-Powervote.

- The electronics cabinet in the back of the VM, contains the main electronics. This cabinet has a slot for inserting the BM. When this BM is inserted, the machine reads the specific election configuration and the applicable candidates and options.
- A Control Unit, connected to the electronics cabinet, is used to 'activate' the voter's panel by the member of the polling station staff pressing a button on it. It also enables the staff to put the VM into functions mode for opening and closing the poll procedures.



3.1 Machine Hardware

The ESI2 VM machine hardware is built up as shown in the picture below:



3.2 Machine Software

All Voting Machine software is written in ANSI C. It consists of three main parts:

1. Main Board Software: The embedded VM software that communicates with the voter's panel and the ballot module. It displays the voter's preferences and stores these preferences in the BM when the cast vote(s) button is pressed. It consists of about 25,000 lines of source code. The source code is compiled by a Metrowerks ANSI C compiler. The development environment is PC based.
2. Connection Board Software: The connection board software connects the 5 display boards,

which communicate via an I²C bus, with the parallel interface of the main board. The source code is compiled by an IAR compiler. The development environment is PC based.

3. Display Board Software: The display board software is responsible for handling the communication with the membrane switches and the LED displays on one side and the communication with the connection board on the other side. Each of the 5 display-boards contains the same software. The source code is compiled by the same IAR compiler as the connection board software.

4. Ballot Module

The ballot module consists of two separate flash memories for redundant vote storage. The election configuration and the candidate names and their positions on the voter's panel are programmed into this ballot module before the elections. During the election the ballot module is in the voting machine and the voter's preferences are stored onto this ballot module each time the cast vote(s) button is pressed.

5. PRU hardware/software

The PRU hardware is the same main board as in the Voting Machine. It is equipped with an extra connector for the programming slot of the Ballot Module. It holds the same software as the main board of the voting machine.

6. Integrated Election Software (IES)

IES operates on a PC with Windows software installed. It is structured in a way to enable electoral administration staff to input all data relating to poll(s). This includes candidates' details, polling stations, poll data, etc. This data is then used to programme ballot modules, which are installed into voting machines for the purpose of recording votes. Once the polls close the ballot modules are delivered to a reading in point. The vote data is read into IES and it carries out the count. IES then makes presentation of final results.

Summary of the development environment (more detailed information can be found on the CD "Technical Documentation IES Ireland", last updated 28 October 2004):

The programming language used throughout is Delphi 5.0.

Additional Tools/components used:

- Opus – Database engine
- Multilizer – support multiple languages
- Asyncpro – Serial communication tool
- EurekaLog – Error handling/logging tool

- ESD_32 – Communication library Nedap
- Several company written libraries

The source code is divided into three parts (as in the code review reported by Nathean):

- Source code A (PR/STV Count module):
 - 39,191 lines of code
 - 120 pas-files (2,634,153 bytes)
 - 71 dfm-files (1,367,210 bytes)
- Source code B (Management software):
 - 52,151 lines of code
 - 101 pas-files (1,469,467 bytes)
 - 72 dfm-files (458,643 bytes)
- Source code Votereader (programming/collection-module):
 - 6,154 lines of code
 - 9 pas-files (145,063 bytes)
 - 7 dfm-files (44,470 bytes)

IES uses the Microsoft Jet database, also used by MS Access 97 and up

- General Database
 - Tables - 23
 - Minimum size - 1060 Kb
 - Occurrence - once
- Election Database
 - Tables - 32
 - Minimum size - 472 Kb
 - Occurrence - once for each election

Update Count rules:

- Count requirements and Commentary on count rules dated 23 June 2000
- Amendment of count rule determining order of election at local elections
Article 88, Local Elections Regulations, 1995 (S.I. No. 297 of 1995)
Made under section 22 of the Local Government Act, 1994 (No. 8 of 1994)
- Update No. 1 dated 23 February 2001: Section 2: Pre-Count menu
Section 19: Screen/Print: Surplus distribution

Section 27: Print: Result sheet (during count)
Section 30: Screen/Print: Order of election (local election)
New: Petitions menu

- Update No. 2 dated 9 April 2001: (A) Filling of last seat(s) shortcuts
(B) Excluding candidate(s) with zero votes
(C) Report writing
- Update No. 3 dated 1 October 2001: Reconciliation of voter accounts
- Update No. 4 dated 2 October 2001: STV count rules excluding ‘deposit’ and ‘election expenses’ provisions
- Update No. 5 dated 8 January 2002: New count summary screen
- Update No. 6 dated 14 March 2002: Export of count screens
- Update No. 7 dated 14 April 2002: Available surpluses and candidates with zero votes

