

Election Magic

Technical Whitepaper

1.0 Introduction

This paper gives an overview of the functionality of Election Magic, and the interaction between the Election Magic product and the underlying operating system. The purpose of this paper is to provide enough information on the operation of Election Magic to help in determining whether the Election Magic product can be safely installed and used on the PCs running the Qualified Voter File (QVF) software.

2.0 Election Magic Overview

This section gives a brief overview of the Election Magic product to provide context for the technical discussion that follows in the next section.

2.1 About Election Magic

Using Election Magic, two basic tasks are performed. The first is done prior to the night of the election. This task involves setting up the election spreadsheet, creating information needed for the web pages, and setting up any satellite workbooks (discussed below) that will be used. The second activity is done on election night. This involves entering data into the master and any satellite workstations, merging the data from all satellite workbooks into the master workbook, and uploading the information to the Internet.

Election Magic is actually a Microsoft Excel spreadsheet with Visual Basic for Applications (VBA) functions, and two Windows console “helper” programs that run on the local PC. There is a component of the Election Magic system that runs on a separate web server (www.electionmagic.com) that tracks results, but that component does not affect the QVF system.

2.2 User Interface

The user enters information for a particular election through the use of VBA-generated dialog boxes. These dialog boxes allow the manipulation of information such as the name of races or proposals that will be on a ballot; formatting of the information on the spreadsheet; making multiple sheets for large counties; and adding AVCBs for the election. The spreadsheet that is created by the VBA code has a list of offices and proposals across the

top of the spreadsheets, and a list of voting precincts down the side. The end product will look like this:

Order	Precinct	Poll	John Book	Geoffrey Englar	Fieger	TOTALS	Nick Smith	Jim Berrym
1	Algansee	0200001	0	0	0	0	0	0
2	Batavia	0400001	0	0	0	0	0	0
3	Bethel	0600001	0	0	0	0	0	0
4	Bronson	0800001	0	0	0	0	0	0
5	Butler	1000001	0	0	0	0	0	0
6	California	1200001	0	0	0	0	0	0
7	Coldwater #1	1400001	0	0	0	0	0	0
8	Coldwater #2	1400002	0	0	0	0	0	0
9	Gilead	1600001	0	0	0	0	0	0
10	Girard	1800001	0	0	0	0	0	0
11	Kinderhook	2000001	0	0	0	0	0	0
12	Matteson	2200001	0	0	0	0	0	0
13	Noble	2400001	0	0	0	0	0	0
14	Ovid	2600001	0	0	0	0	0	0
15	Quincy #1	2800001	0	0	0	0	0	0
16	Quincy #2	2800002	0	0	0	0	0	0
17	Sherwood	3000001	0	0	0	0	0	0

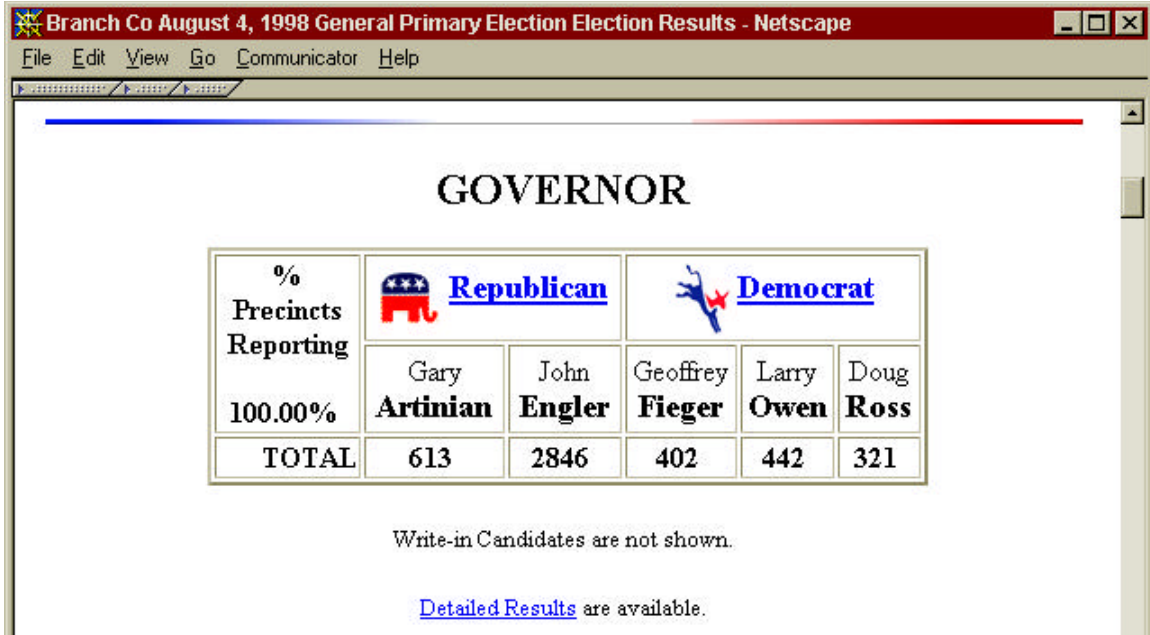
2.3 Network Interface

Election Magic can be used in many network configurations, allowing many people to enter data into the same spreadsheet concurrently. Election Magic supports local area networks, sneakernets, and entry from remote locations that have Internet connectivity. The user has an opportunity to create copies of the master workbook called “satellite workbooks.” The data entered on the satellite workbooks can be sent to the PC that contains the master workbook, and the master workbook then uses the native Excel “merge” function to merge all of the satellite data into a single master spreadsheet.

2.4 Automatic Creation of Web Pages

The other major component of the Election Magic program is to post election results on the web in real time. In order to allow the election results to be posted in real time, the PC that contains the master workbook must be connected to the Internet. Election Magic automatically creates web pages from the spreadsheet data, stores a copy of the web pages on the local machine, then sends the data to the Election Magic server. Web pages displaying the results are then created on the web server, ready for public inspection.

The web pages include both summary data for each race, as well as the distinct precinct-by-precinct results as they are reported. A portion of a summary web page is pictured below.



A more complete example can be seen by going to <http://www.electionmagic.com/> and navigating to the *Archived Results* section.

3.0 Election Magic Operating System Interface

Because the bulk of the Election Magic code is written as a VBA program inside of Excel 97, the interface to the operating system is limited to the calls that are made through the Excel-provided VBA interface. These consist primarily of calls to display custom dialog boxes, and perform file manipulation on files specific to the Election Magic product. Additionally, there are the two DOS-mode programs that are invoked by the VBA inside of Excel (discussed below).

3.1 Directory Hierarchies

When Election Magic is installed, a directory heirarchy is created for the Election Magic workbooks, graphic images for the web pages, and precinct data. When the user creates the web pages that will be used, these are stored in a separate hierarchy on the C: drive (e.g., C:\B12EMDat for Branch County). The VBA code does not read or write files outside of these two hierarchies and the directory containing the master workbook.

3.2 Windows Console Programs

As indicated above, there are two DOS-mode programs that are invoked by the VBA code. The VBA code creates two batch files and then runs these batch files via a DOS shell function in VBA. The two programs, MAKESST and MAKERES, were written in C

and compiled using Microsoft Visual C++ 5.0. MAKESST makes the web templates from the data in the spreadsheet, while MAKERES “fills in” the web templates with the data that the user has entered. Each of these programs is statically compiled, and use no DLLs. These programs make standard OS calls to open, read, and write the web template files and input files (comma delimited data and information files produced by the VBA code). They also use *malloc* for memory allocation. These programs run only when invoked (that is, they are not “daemonized”), and terminate before the VBA code resumes.

3.3 Data Transfer

All file transfers (from the satellite workbooks not on a local network and from the master workbook PC to the Election Magic server) are performed using the standard File Transfer Protocol (FTP). FTP is implemented by an FTP control from within VBA. This control uses standard Microsoft APIs for accessing the network stack. The VBA code accesses satellite workbooks on a local network using standard file open calls, relying on Microsoft peer networking services (that is, it depends on the workstations containing the satellite workbook having their drives “mapped” to a drive on the master workstation PC).

3.4 System Requirements

We believe that Election Magic is a good candidate for running on a QVF PC without interference. It primarily runs within Microsoft Excel 97 (and Microsoft Excel 2000, with some changes), which is approved for use on the QVF machines. When it goes “outside” of Excel 97, it uses statically-linked programs that only access data in files that are in the Election Magic-owned directory heirarchy.

Election Magic has been tested on various base operating system platforms (Windows 95, Windows 98, and Windows NT 4.0) running various additional network applications (SSH, Netscape Navigator, Internet Explorer) without conflict. It adds two controls to the Windows system directory (a high-resolution timer and an FTP control); these controls do not replace or modify any “standard” Windows controls.

We would recommend that if Election Magic is provisionally approved for use, KBEIIICO technicians work with technicians from the State to qualify Election Magic for use on a QVF machine by running Election Magic and determining if there are any undesirable interactions.