

Thin Client Voting System

The Cost of Paper Voting?

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Outline

- 1 Previous Voting Systems
- 2 Research Problem
- 3 Windows vs. Linux
- 4 Maryland Voting System Costs
- 5 LTSP Hardware

Previous Voting Systems

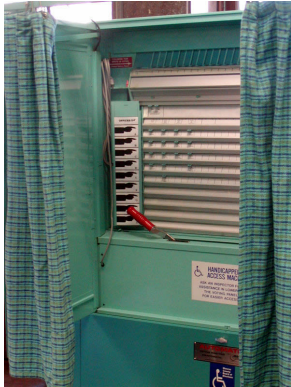


Figure: Lever Operated Voting Booths

Previous Voting Systems cont'd

Confusion over Palm Beach County ballot

Although the Democrats are listed second in the column on the left, they are the third hole on the ballot.

Punching the second hole casts a vote for the Reform Party.



Sun-Sentinel graphic/Daniel Niblock

Figure: Punch Card Ballots

Previous Voting Systems cont'd



Figure: Optical Scan Machine

Previous Voting Systems cont'd

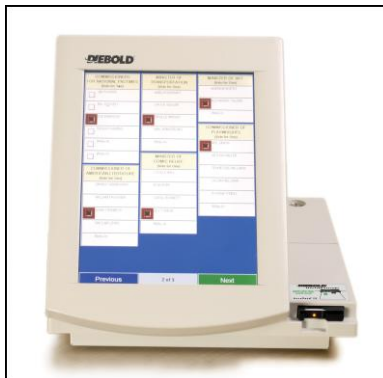


Figure: Diebold Touchscreen System

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- Dumb terminals offer the possibility of drastically reducing the cost of electronic voting

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- Today, each booth is provided with an expensive computer to run a simple program.
- **Hypothesis:** Thin client voting systems are cheaper than paper voting systems from day one.

Windows vs. Linux

Windows

- Windows Terminal Server
- 3rd party software needed for dumb terminals
- Terminal Server License required
- Each terminal must have their own license

Linux

- Linux Terminal Server Project (LTSP)
- Open source (no licenses required)
- Easily customizable
- No viruses, much lighter processor and memory requirements

LTSP

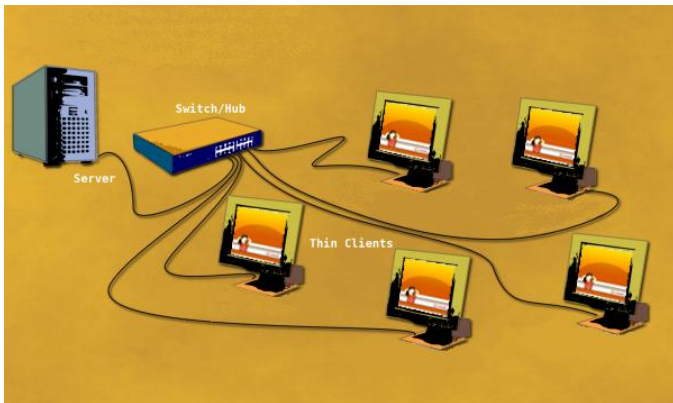


Figure: LTSP server model

LTSP cont'd

How it works...

- 1 Terminal's PXE network card sends a DHCP request to the server
- 2 Server reply tells the terminal from where to boot the linux kernel
- 3 Terminal collects kernel through TFTP protocol
- 4 Linux kernel is loaded on the terminal
- 5 Second DHCP request is sent to gain final information and files

SAVE Our Votes

Secure Accessible Verifiable Elections for Maryland

- Cost Analysis of Maryland's Electronic Voting System (2008)
- Voting activist group arguing that Maryland move back to optical scan machines



Estimated Cost of Current Diebold System

Estimated costs based on 2,000 precincts with 10 booths each

¹

Item	Unit Cost	# of Units	Total
Voting Machines	\$3,000	20,000	\$60,000,000

¹http://www.verifiedvoting.org/downloads/CT%20SOTS1appendix_43.pdf

Actual Cost of Current Diebold System

Actual cost in Maryland for Diebold hardware plus interest on loan:

²<http://www.saveourvotes.org/legislation/packet/08-costs-mdvotingsystem.pdf>

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\$67,463,291²

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Projected Cost of Optical Scan

Estimated cost based on 2,000 precincts with 10 booths each

Item	Unit Cost	# of Units	Total
Scanner	\$4,200	2,000	\$8,400,000
Ballot Marking Machine	\$4,950	2,000	\$9,900,000
Total			\$18,300,000

3

+ \$800,000 per election for paper ballots ⁴

³<http://www.saveourvotes.org/legislation/packet/08-costs-mdvotingsystem.pdf>

⁴3.2 million registered voters, \$0.25 per ballot


Projected Hardware Cost of Thin Client System

Estimated cost based on 2,000 precincts with 10 booths each

Item	Unit Cost	# of Units	Total
Server ⁵	\$1,500	2,000	\$3,000,000
LTSP Terminal	\$285	20,000	\$5,700,000
Touchscreen	\$205	20,000	\$4,100,000
Total			\$12,800,000

80% cheaper than Diebold System

30% cheaper than Optical Scan System

⁵Server + backup server + 16 port gigabit switch 

Suggested Hardware Requirements

Recommended specs based on everyday use of Open Office, Firefox, etc.

Server Specs ^a

- Ram: 256MB + (50MB * number of terminals)
- Processor: Multiple CPUs or Dual Core processor
3GHz good for 30 users
- Switch: Gigabit between server and switch
100mbps between client and server

^a<http://wikiltsp.org/twiki/bin/view/Ltsp/ServerSizing>

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Terminal Specs

- 400 to 800 MHz processor
- 32MB Ram minimum

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Possible Hardware

Hardware Expense Per Precinct

Item	Quantity	Cost	Total
HP Pavilion Server ⁶	2	\$529.99	\$1059.98
DLink 16-Port Gigabit Switch	1	\$199.99	\$199.99
LTSP 1220 PXE Terminal ⁷	10	\$285.95	\$2859.50
NEC AccuSync 15" Touchscreen	10	\$205.69	\$2056.90
Total			\$5176.37

⁶AMD Athlon Dual Core with 3GB Ram Bestbuy.com

⁷800MHz with 128MB Ram DisklessWorkStations.com

Initial Hardware Costs

Projected Statewide Hardware Costs for Maryland

System	Cost	Yearly Cost Over 7 Years
Diebold Touchscreen	\$60,000,000	\$8,571,429
Optical Scan	\$18,300,000	\$2,614,286
Thin Client	\$12,800,000	\$1,828,571

Any Questions?

