

## SOME OF THE CHALLENGES THAT CAN BE ADDRESSED WITH A NEW TYPE OF VOTING SYSTEM

CHALLENGE	ISSUE	RESOLUTION
<p>Voting system should allow for the use of early voting, mega-voting sites, and election day vote centers*. At the same time, the system must minimize the use of paper which generates significant monetary and environmental waste. The creation and management of the paper ballots must minimize security risks and not significantly slow the flow through the voting process.</p>	<p>A residence address determines which jurisdictions a voter may participate in (state, county, city, school district, service district, utility district, etc.). These jurisdictions can overlap and may not follow precinct lines. Within each jurisdiction, the voter’s address may also trigger further divisions (legislative districts, single member districts, political party precinct officials, etc.). As a result, for each election, there may be hundreds of different ballot formats to ensure that the right ballot is available to match each particular set of candidates and issues the voter is eligible to vote on. Existing systems utilize two methods for managing this situation – they either maintain a continuous inventory of paper ballots with every possible ballot format at every location or have a system that prints out a specific ballot after each voter’s ballot format is determined. The first method is cumbersome, expensive, insecure, and provides great opportunity for human error. The second system requires bulky, high-quality printers that print out large ballot pages and use expensive toner. Reliance on one or two printers at a polling location creates a bottle neck and results in a higher risk of problems in the event of equipment failure.</p> <p><small><i>*(Early voting, mega-voting sites, and election day vote centers all require a voting system to manage voters from any precinct within the county. Mega-voting sites are large facilities that can be used during early voting and on election day to quickly process large numbers of voters. Election day vote centers are polling places that act like early voting locations to allow any eligible voter to vote at any location throughout the county.)</i></small></p>	<p>Design a system that has a light-weight, inexpensive thermal or ink jet printer at each voting booth. The system should print out only the voter’s selections with a corresponding number or 1-D bar code (instead of the entirety of the ballot) that contains only a simple number that can be easily read by a simple scanner on the ballot box. (1-D bar codes are required because they contain limited information and can be easily decoded – even using a smart phone.)</p>
<p>Voting system should rely as little as possible on customized proprietary hardware and instead predominantly use commercial-off-the-shelf (COTS) hardware.</p>	<p>Currently, voting system vendors sell both proprietary hardware and software. A better solution would be to allow election administrators to use off-the-shelf high quality hardware that is less expensive and competitively bid. This will also allow a county to size-up or replace certain pieces of equipment when necessary, reduce maintenance costs, and enjoy product innovation without reliance on a voting system vendor’s decision to upgrade or apply for recertification.</p>	<p>Design a voting system that wherever possible uses COTS hardware.</p>
<p>Voting system should provide proof that it is well designed, utilizes best practices for security, and allows a variety of tests to be done to verify the accuracy of the count.</p>	<p>The use of proprietary software and a difficult certification process has created a disincentive for vendors to maintain updated versions of software. Modularity with open source reference implementation could decrease the number of segments of a system that require certification. Open source reference allows full review of data as it moves from one module to another, while not revealing trade vendor product information within the modules. Security measures are predominantly based on limiting physical access and verification practices have evolved little beyond basic logic and accuracy testing. For example, encryption methods could be used to allow the performance of community-conducted live parallel testing. The software also needs to provide a means for reducing the chance for tampering during the transportation process and a means for efficiently conducting risk limiting audits of the paper ballots.</p>	<p>Create specifications that go much deeper into technical requirements than before and require an independent (but nondisclosure protected) review of the product during and after development. Increase the types of audits that can be performed and increase modularity with open source reference implementation.</p>
<p>Voting system must have a secure and transparent methods of ensuring voters are given the correct ballot format.</p>	<p>One of the most problematic areas of the voting process is ensuring that the election worker provides the voter with the correct ballot format. With overlapping jurisdictions and districts that sometimes do not conform to precinct boundaries; a single precinct can have multiple ballot formats (Precinct 301a, 301b, etc.). It does not take much for all these boundary lines to confuse the most experienced politico much less an average member of the community who is valiantly serving as an election worker. To maintain security most electronic voting systems separate the voter qualification system from the tabulation section to prevent the possible introduction of a computer virus into the voting system. This “air gap” requires the election worker to reenter the ballot format information into the voting system so that the voter is given the proper ballot choices. This is where errors occur. Some voting systems are designed to scan in a 2-D bar code that not only includes the ballot format information, but also programming code that tells the system what to do with that number. Going beyond a 1-D bar code and including commands adds unnecessary security risks.</p>	<p>Design a system that has an automated and secure method for issuing ballot formats to voters.</p>
<p>Voting system should ensure the accurate tabulation and interpretation of voter intent on paper ballots.</p>	<p>Voters have a variety of ways of marking their choices on paper ballots. While instructions may say to “put an x in the box.” Voters may instead use checks, circle their choices, “x” out all of the candidate names they do not want to select, or just accidentally make stray marks on the ballot. The goal of election officials is to make certain that every effort is made to correctly interpret voters’ intent and to have a fair way of resolving questions regarding these issues. Recounts and court challenges to election results often concentrate on whether or not specific ballots are properly interpreted. Current paper based systems use precinct ballot counters to scan a ballot and then to immediately notify a voter when an irregular marking is found. If set to its most sensitive level, backlogs at the ballot box can occur as voters may be repeatedly asked to clarify their selection. Some entities remedy this by reducing the review of the scanner (for example, to not question under votes - races where there appears to be no mark in the “square” for any candidate or race). While this may speed the process, it decreases accuracy in the determination of the intent of the voter.</p>	<p>Design a system that has the ability for the voter to produce machine-marked ballots that can be verified by the voter before they are officially cast.</p>
<p>Voting system must create reports in formats that meet a wide variety of needs.</p>	<p>Current voting systems have limited capability in producing the types of return formats that are needed by our customers.</p>	<p>Design a system with flexibility to produce reports that meet the specific needs of the administrator, are compatible to media reporting software, can be put into XML format, and conform to the soon-to-be national standards for providing election data.</p>