

Parallel Internet and Paper Elections – a Practical PIPEline to Secure and Accessible Elections

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1 Introduction

Internet voting has the potential to expand the true democratic process in our country by making our elections more secure and more accessible. Voters with disabilities, active-duty military, first responders, citizens living outside the country, and citizens who are unable to vote due to unforeseen circumstances have benefitted tremendously from voting over the internet. While more than half of our states allow electronic return of ballots for UOCAVA voters, only a handful of states allow voting over the internet for any other voters.

The fundamental apprehension that has been used to delay the widespread adoption of internet voting in the United States is the notion that malicious actors could materially alter the outcome of an election and that their actions could potentially go undetected, thereby creating an unknown level of risk. Recent pilot projects have offered some practical approaches to significantly reduce this risk through a combination of voter verified receipts and citizen-led audits. In the event that a malicious act is detected, the process to correct results, if required, can still be complicated, depending on the jurisdiction's rules and regulations.

It goes without saying that cybersecurity threats to an election are to be taken extremely seriously. While several online voting pilot projects have demonstrated that such threats can be successfully mitigated in practice, experts continue to differ on whether these threats can be successfully mitigated at a national scale.

2 The Big Question

Could we reduce or eliminate the unknown risk of internet voting?

3 Common Elements to Potential Solutions

We propose a pair of solutions, which we believe to be reasonable: a Parallel Internet and Paper Election (PIPE). Both solutions have several means to carry out in practice. This section discusses elements common to both proposals. Sections 4 and 5 provide details specific to each proposal. In brief, a PIPE does the following.

1. A voter marks a paper ballot and an equivalent digital ballot with the same choices.
2. The voter sends the official and the equivalent unofficial marked ballots to the jurisdiction.
3. The jurisdiction records the official ballot.
4. After the election, the paper and digital ballots are compared.

Both methods require casting an official ballot over one channel and transmitting an unofficial ballot (with the same selections as the official ballot) over another channel. Both channels are remote ballot delivery channels; one is “traditional” (mail, official dropbox, etc.) and the other is a digitally secured internet transmission via a web browser or mobile app. Note that we use the term “cast” to refer to the submission of an official ballot and “transmit” to refer to the delivery of an unofficial ballot to the jurisdiction. The two ballots should each have a unique ballot ID in order to compare them after the election. Also, the unofficial ballot should have a clear indication that it is not to be counted so that it is not accidentally tallied.

It is crucial that measures be put in place to ensure that the selections on the official and unofficial ballots are identical. If voters mark two ballots, then there is the potential for human error if a voter accidentally makes different selections or simply forgets the selections on one ballot. Also, antagonists to internet voting would be inclined to be dishonest and submit different selections on their official and unofficial ballots in their effort to discredit internet voting.

After the close of the election, election officials or auditors can compare the official and unofficial ballots to see if the ballots are the same and if not, if there have been any modifications to either ballot. If there is a large number of ballots involved in a PIPE, then the principles of a risk-limiting audit can be applied. Randomly choose a statistically significant proportion of the unofficial ballots to compare with their corresponding official ballots. (We note that a remarkably small percentage of the ballots would be needed to produce a statistically significant result.) If the official and unofficial ballots are the same in each case, then there can be increased confidence in internet voting.

4 PIPE Proposal 1: Paper Ballots are Official

In the first PIPE proposal, the official ballot is the paper ballot cast via a traditional remote return channel, while the unofficial ballot is transmitted over the internet.

A jurisdiction that wishes to run a PIPE would allow a significantly large group of volunteer voters to cast their official ballot as planned, as well as submit an identical unofficial ballot electronically. Each volunteer should either be a proponent of internet voting or be neutral to the concept, in order to reduce the chance that the PIPE pilot is sabotaged by an opponent of internet voting. Nevertheless, some mechanism should be in place to ensure that the selections on both ballots that are submitted are identical.

To ensure identical paper and digital ballots, one option is to have voters mark their ballot choices using a mobile app or other program. The program creates a PDF ballot, which is then printed. Meanwhile, the app submits the unofficial ballot electronically. Another option is for voters to mark an official ballot by hand, then before submission, scan or take a picture of the ballot with an app. The app would read the ballot selections and submit the unofficial ballot electronically. Meanwhile, the hand-marked ballot is cast via a traditional method. A third option is that the voters mark their ballots by hand, then mark ballot choices in an app or internet portal, and finally scan or take a picture of the official ballot for submission along with the digitally marked ballot. The image of the hand-marked ballot would be checked if there are differences between the official and unofficial ballot.

This experiment does not increase the risk to an election since the unofficial ballots are sent over the internet. An audit structured like a risk-limiting audit would assess the practical security of internet voting. If there are differences between any pair of ballots, then digital forensic analysis may determine the reason for the difference.

5 PIPE Proposal 2: Digital Ballots are Official

In the second PIPE proposal, the ballots cast over the internet are the official ballot. The jurisdiction would allow voters to return their ballot via a digitally secure internet browser portal or mobile app. Of

this group of voters, a set of volunteer voters would also print out their PDF ballot or ballot receipts from the app or browser and submit it by any traditional remote return means. A nice gesture would be to reimburse the voters who volunteered to submit unofficial ballots for postage or other expenses incurred for returning the paper ballot.

Again, after the election, election officials or auditors compare a statistically significant sample of unofficial ballots with their corresponding official ballots. If there is no statistically significant difference between the official and unofficial ballots, or if the difference is so small so as to not cast doubt on the outcome of any given election, then the election results stand. The individual States and Territories must decide beforehand how to proceed if there is a significant difference between the two sets of ballots, especially the difference is large enough to call any election result into question.

6 Conclusion

The best way to prove the effectiveness and security of internet voting is through actual implementation in a live election. A parallel internet and paper-based election (PIPE) provides a means to test that effectiveness and security while maintaining the risk profile of traditional remote ballot return methods. Adopting any procedure within either of these PIPE proposals would therefore mitigate the known and unknown risks of internet voting to an election, increase confidence in internet voting, and would increase election access and integrity.