

Online Electronic Voting and Voter Authentication

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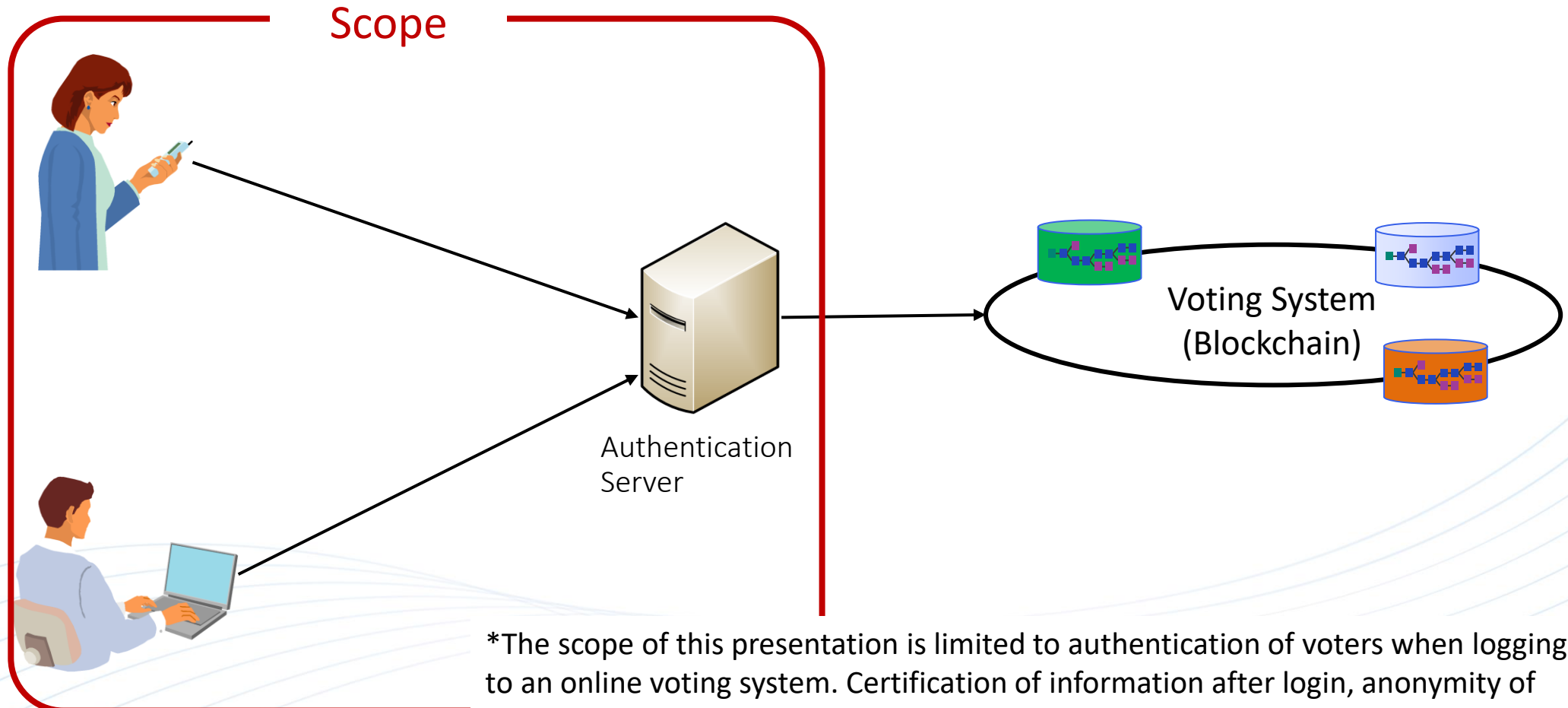


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Background: Adequate authentication for online voting

This presentation will establish the requirements and challenges relating to authenticating eligible voters in an online electronic vote; evaluate the existing authentication technologies; and propose a secure architecture.



*The scope of this presentation is limited to authentication of voters when logging in to an online voting system. Certification of information after login, anonymity of voting data, etc., are beyond the scope of the presentation.

Categorization of existing technologies for authentication

No.	Category	Sub-category	Summary	Notes
1	Authentication using knowledge	ID/password, e-mail address	User logs into system with previously registered ID/password	
2		PIN authentication	User logs into system with previously registered 4-8 digit number	
3		Personal information	Authentication using personal information such as address, full name, birth date, etc.	
4		PKI certificate (browser)	Authentication protocol conducted using a private key saved on the user's local storage device	
5		Cookie (browser)	Authentication using browser's cookie function	
6	Biometric authentication	Fingerprints	Authentication using previously registered fingerprints	Device required
7		Palm veins	Authentication using previously registered finger/palm veins	Device required
8		Facial recognition	Authentication using previously registered facial photo	Device required
9		Other	Iris scanning, etc.	Device required
10	Authentication using hardware and electronic devices	IC card authentication	Authentication protocol conducted using a private key contained in previously distributed IC card, such as My Number card	Device required
11		One-time token	Using previously distributed hardware or software token	Device required

Requirements and Challenges of Authentication in Online Voting

- Can the rightful voter vote properly?
- Can it prevent third parties' fraudulent voting?
- Can it be used by users with low IT literacy, such as the elderly (inclusion)?
- Are voters required to prepare a special device?
- Does the burden on voters reduce in comparison to normal voting (visiting a voting center to vote)?
- How expensive is the operating cost? Is it less than current cost?

*Repeat: Voting confidentiality and protection of private information are beyond the scope of this investigation

Evaluation Criteria of Online Voting Methods

Existing technologies' applicability to online voting will be evaluated using the following 7 criteria based on the requirements and challenges on the previous page

No.	Criteria	Summary	Evaluation Scale	Note
1	Login success	Can the voter login successfully with the correct operation?	○ : Successful login × : Failed logins occur	
2	Voter fraud	Are third parties prevented from posing as voters and voting fraudulently?	○ : Realistically difficult (for normal voting) △ : Possible fraud under certain conditions × : Possible fraud under normal conditions	
3	Inclusion	Can the elderly use it? Does it use special knowledge or devices when voting?	○ : Can vote with only internet-connected device △ : Also uses widely available device × : Uses special knowledge or device	
4	Voter burden prior to voting	Burden of pre-registration in the system	○ : No burden △ : Internet registration × : Paperwork or biometric registration required	
5	Voter burden during voting	Burden arising during voting	○ : Less than normal voting × : Same as normal voting	
6	Operating system cost	Preparations, operating server costs on voting day, other administrative costs	○ : Less than normal voting △ : Same as normal voting × : More than normal voting	
7	Track record	Past performance in online authentication	○ : Previously used for online voting △ : Previously used for online authentication × : No significant track record	

Evaluation of existing technologies for authentication

Results of evaluation of existing authentication technologies using the 7 criteria

	Criteria	Login Success	Fraud	Inclusion	Advance Burden	Burden During Voting	Operation Cost	Track Record
1	ID/password, e-mail address	○	×	○	○	○	○	△
2	PIN authentication	○	×	○	○	○	○	△
3	Personal information	○	×	○	○	○	○	△
4	PKI certificate (browser)	○	×	○	△	○	△	△
5	Cookie (browser)	×	×	○	○	○	○	△
6	Fingerprints	△	×	△	△	○	×	△
7	Palm veins	△	○	×	△	○	×	×
8	Facial recognition	△	△	○	△	○	△	×
9	IC card authentication	○	×	×	△	○	×	△
10	One-time token	○	×	×	△	○	×	△

For multi-layer authentication, this criterion alone cannot be an “and” condition but must be an “or” condition

Observations on Evaluation Results

- None of the existing authentication technologies excels in all criteria.
⇒ The number of ○'s can be increased with multi-layer authentication
- If security against criterion #2, "Fraud", is prioritized...
⇒ Palm vein authentication is the best option
⇒ Requires special device when voting; has high cost

How about combination of IC card with facial photo (e.g., My Number card) and facial recognition?

*Assuming My Number cards are widely distributed, this would result in ○'s for Inclusion, Advance Burden, and Operating Cost, offering a system with almost all △'s and ○'s.

	Login Success	Fraud	Inclusion	Advance Burden	Burden During Voting	Operation Cost	Track Record
Facial recognition + My Number card	△	△	○	○	○	○	×

Proposal for system architecture

- Users acquire My Number cards in advance and register on voting system
 - *Requires installation of specialized app on smartphone and IC card reader
- When voting, facial photo stored on IC chip checked against face shown on smartphone camera or webcam
 - *Check done using facial recognition technology or visual check by an operator



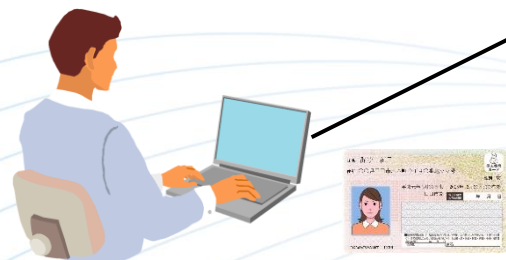
My Number card

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USEN-NEXT GROUP

オンライン資格確認対応
顔認証付きカードリーダー

マイナタッチ

製品説明



My Number card

