General Challenges of e-Voting

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“Traditional” Voting

identification → casting → counting → announcement → auditing
Fundamental Requirements of Voting

- Integrity
- Privacy
- Availability
Traditional Voting & Requirements

• **Privacy** is guaranteed via **physical means**: (e.g., private booth, ballot box, opaque envelopes).

• **Integrity** is guaranteed via reliance on **continuous oversight**, (e.g., presence of accredited observers).

• **Availability** is guaranteed via **procedural means**: (e.g., announcing the election day ahead of time and allowing sufficient time to vote, ability of presiding officer to call the police).
E-Voting

E-voting: using computers in at least one of the following three voting processes:

- Identification of voters
- Casting the vote
- Counting the vote
  - (announcing/auditing)

Source: https://www.e-voting.cc/en/it-elections/definitions/
From Traditional Voting to E-voting
From Traditional Voting to E-voting

e-counting

[Diagram showing a transition from traditional voting to e-voting]
From Traditional Voting to E-voting

ballot scanning / direct recording electronic
From Traditional Voting to E-voting
The benefits of e-voting

- **Increase the participation** of social groups that face considerable physical barriers.

- **Increase the efficiency** of the preparation of the election and the calculation of the final results.

- **Reduce the financial cost** of the elections (in long term).
The risks of e-voting

- Software vulnerabilities and/or the availability of digital transcripts may lead to privacy leaks. (privacy)

- Protocol and software vulnerabilities may lead to large-scale manipulation by a small group of insiders. (integrity)

- Interference (via electronic means) may cause denial of service & selective disenfranchisement. (availability)

- Auditing may require substantial technical expertise.
Is it really that bad?

What, Me Worry?

we fly planes “by wire” so how come it’s hard to vote “by wire”?
Yes, it is!

- The adversary in voting can be immensely more sophisticated than in other settings.

- You may never know the system was hacked!
Is there a way forward?
...There is a way forward

- Modern cryptography provides a thorough methodology for designing and formally establishing the security of voting systems.

- Use it in order to extract and standardise the proper specifications of e-voting systems.

- Impose a rigorous compliance regime to the e-voting systems that are adopted.