

# TIVI – Verifiable Voting Accessible, Anytime, Anywhere

**TIVI –  
convenient,  
accessible,  
secure and  
verifiable**

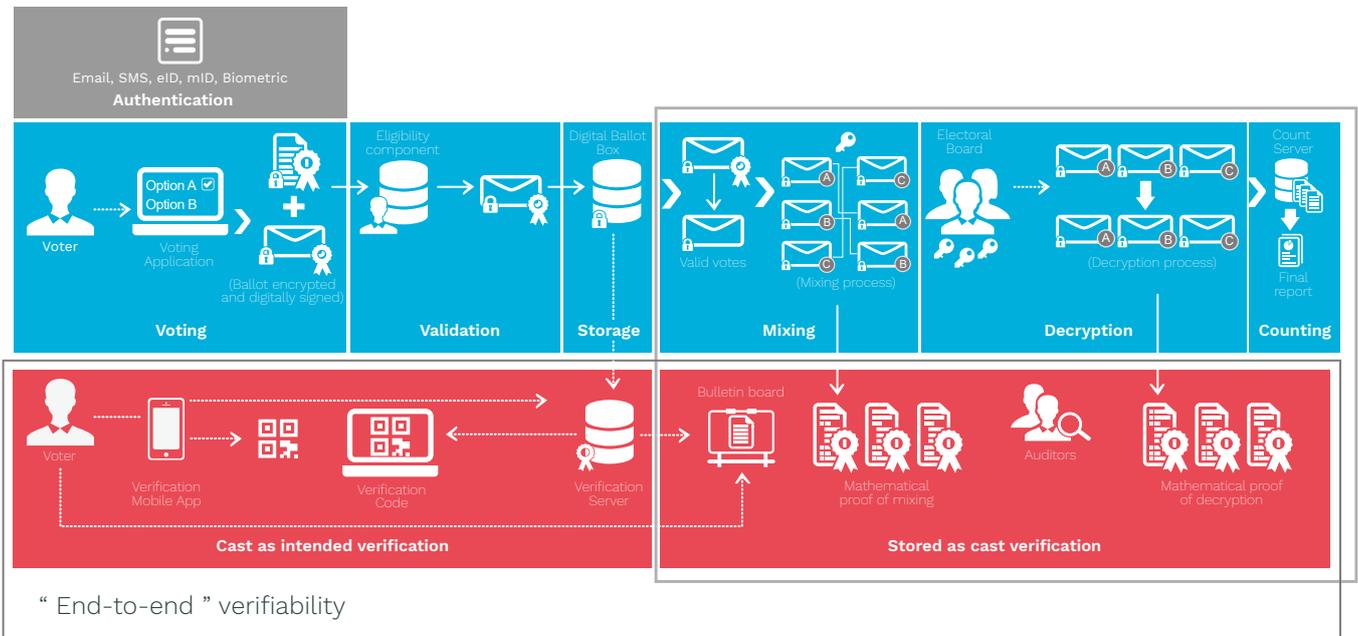
TIVI is the class-leading online voting solution for government elections, which has been engineered to offer Electoral Management Bodies (EMB's) a convenient, accessible, secure and verifiable platform to address the needs of their remote voters and to support increasing voter participation.



Voters are empowered by TIVI to securely cast their ballots from any location using their own laptop, desktop, smartphone or tablet without having to visit a polling station, embassy or consulate or to vote by post (mail).

For EMB's who are seeking to enable remote voting for the first time or to replace traditional forms of remote voting such as postal (mail) voting, TIVI offers them a highly robust and proven solution.

TIVI can be seamlessly integrated into traditional in-person voting arrangements. This enables EMB's to offer multi-channel voting options to better support the needs of the modern voter.



# The TIVI process - cast as intended, stored as cast, counted as cast

TIVI is the most technically advanced online voting solution in terms of addressing security, secrecy and voter anonymity.

# Election

## Authentication

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The voter accesses TIVI and is authenticated via strong authentication techniques including multi-factor and biometric technologies.

## Voting

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The voter accesses the ballot, makes a choice and reviews and casts the ballot. The vote is automatically encrypted and digitally signed on the voting device and securely transmitted to the voter server to maintain secrecy and vote integrity at all times.

## Validation

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The vote is validated as being sent by an eligible voter whilst maintaining vote privacy.

## Storage

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The vote is stored on a fully-redundant, fault tolerant, physically and logically secure infrastructure.

## Voter Verification (optional)

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The voter can choose to verify the contents of the vote received on the voting server by means of a smartphone application.

# Post election

## Mixing

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The encrypted votes are digitally 'shuffled' to obfuscate the relationship between the voter identities and their choices.

## Decryption

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The votes are decrypted in the presence of the multi-party electoral board.

## Counting/Tallying

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The votes are tallied/counted in the presence of the electoral board.

# Auditing / Verification

## Voter audit (optional)

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The voter can verify the integrity of their vote via a public bulletin board.

## Protocol audit

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Independent auditors can verify the election protocol, the version of the software installed and the correct operation of system components and key processes.

# How governments and voters benefit from TIVI

## Increased transparency and guaranteed vote security

TIVI has been conceived and developed to fully address the challenges associated with remote voting. The platform provides an accessible, secure and verifiable way to enhance electoral integrity and better support the democratic process. Harnessing envelope-pushing technologies, world leading research and product development, information security and cryptography, TIVI boasts an unrivalled feature set to maintain vote security, but also increase electoral transparency.

### Accessibility compliance

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Seamless integration with audio browsers (e.g. JAWS, NVDA) and hardware peripherals (e.g. switches, paddles, 'sip-puff' tube). Also, WCAG compliant and different language options.

### Benefit

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Independent voting for blind/visually impaired voters and voters with disabilities.

### Multiple authentication options

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TIVI supports multiple simultaneous access and strong authentication mechanisms including eID, mobile ID, smartphone based 'two-step' verification and biometric access.

### Benefit

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Strong eligibility assurance and elimination of identity impersonation.

### End-to-end encryption and digital signing of votes

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Votes are encrypted and digitally signed on the voter's device. This is often referred to as a digital 'double-envelope' scheme and when utilized along with strong transport layer security (TLS) between the voter's computer and the vote receiving server (digital ballot box), the ballot is securely protected.

### Benefit

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Vote tampering is eliminated.  
Vote secrecy is maintained.

## Universal platform support

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Consistent support for Microsoft Windows, Mac OSX, iOS, Linux, Android.

## Benefit

Participation is maximized.

## Intuitive, responsive UI/UX

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Easy to understand user interfaces eliminate voter error and create a consistently simple user experience across all devices (laptop, tablet, mobile).

## Benefit

Vote marking errors are reduced. Spoiled/invalid ballots are eliminated.

## TIVI open code initiative

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The source code can be reviewed by independent security and accreditation experts. We strongly advocate the use of third party independent authorities as a mechanism of enhancing public trust in any automated election.

## Benefit

Improved electoral transparency and enhanced trust.

## Digital voter verifiability

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The voter can verify that their vote was received exactly as cast by the voting server.

## Benefit

Improved electoral transparency and enhanced voter trust.

## Verifiable vote mixing

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Cast votes are cryptographically mixed to destroy any correlation with the order in which they were cast and to maintain voter anonymity. This takes place on a 'clean', air-gapped decryption server, which has never been connected to the Internet.

## Benefit

Voter privacy is maintained.

## Cryptographic proofs

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Privacy preserving mathematical proofs are created, which verify the correct operation of the mixing and decryption processes whilst maintaining voter privacy and vote secrecy.

## Benefit

Enhanced electoral transparency and improved auditability.

## Immutable system logs

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Ready-made toolsets allow system auditors to successfully audit the voting protocol, system components and processes. API allows auditors to develop their own tools.

All system events and activities are recorded in system logs, which are protected against tampering and/or manipulation.

The full voting protocol can be reviewed and audited. Zero-knowledge mathematical proofs demonstrate the correct operation of core voting processes including cryptographic mixing and decryption.

## Benefit

Full electoral transparency and proof of system integrity

## Blockchain-based Public Bulletin Board

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Voters can verify the presence of their vote in the digital ballot box. The PBB builds a Blockchain of each event, allowing each vote to be traced in the chain, making it impossible to add, remove or modify entries later in the chain without breaking the validity of the chain confirming its integrity. This provides proof that no eligible votes have been altered and/or deleted and no ineligible votes have been added.

## Benefit

Improved transparency and proof of ballot box integrity.

## Multi-party vote decryption

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Vote decryption is initiated by collaboration of approved electoral board members who are required to reconstruct the private election key.

Each board member possesses a share of the election private key. These key shares must be combined to recreate the election private key decrypted using a secret key-sharing process by a quorum of approved members of the electoral board.

This technique ensures that no single individual can decrypt and therefore delete, add or tamper with votes in the digital ballot box.

## Benefit

Protects security of decrypted votes and protects against leakage of intermediate election results.

## Universal verifiability

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TIVI provides demonstrable proof that votes were cast as intended, stored as cast, counted as cast. Voters can verify that their vote was correctly received by the voting server, through a smartphone based voter verification app.

Voters can verify the integrity of their vote using a Blockchain-based public bulletin board.

Zero-knowledge mathematical proofs can be used to verify the correct operation of core voting processes including cryptographic mixing and decryption.

## Benefit

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Enhanced electoral transparency. End-to-end evidence of electoral integrity and effective operation of security measures.

## Supports in-premise and cloud based deployments

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System can be deployed in an EMB dedicated infrastructure or secure cloud environment

## Benefit

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Improved operational choice and greater flexibility for EMB's.

# Universal digital verifiability

# A full-service portfolio to support online voting projects

## Benefit from 25 years of experience in election technology

With more than 25 years of combined experience in election technology, having run some of the largest and most complex elections in the world, Smartmatic and Cybernetica not only offer world-leading technology, but also high-quality project management, consultancy and R&D services:

- **Legal framework guidance**  
Assisting EMB's to define legal frameworks for remote online voting
- **Online voting technology**  
Proven technology solutions to enable class-leading online voting projects
- **Online voting project delivery**  
Service delivery capability to successfully conduct online elections
- **Cryptography Research & Development**  
Research, development and implementation of secure, verifiable cryptographic protocols
- **Electoral consulting**  
Election analysis, technology consulting, process improvement and best practice

# Smartmatic & Cybernetica

## Unrivalled, proven expertise

In 2014, Smartmatic and Cybernetica founded a multidisciplinary center of research and development, aiming to advance online voting on a global scale. TIVI is the result of this successful partnership.

TIVI is developed by the engineering teams who developed the Estonian Internet voting solution, which is the only permanent governmental i-voting platform in the world, having successfully delivered 8 consecutive nationwide elections since 2005.

TIVI offers election management bodies a proven online voting platform, backed by globally recognized leaders in secure voting technologies with a 100% success rate in the delivery of secure electronic elections.

Smartmatic is the leading provider of voting technologies and solutions worldwide. Today, out of the eight countries pioneering election automation Smartmatic provides technology and services to six of them: Belgium, Brazil, Estonia, the Philippines, US and Venezuela. Smartmatic supported EMB's in managing their elections across five continents, processing almost 4 billion votes.

Smartmatic is ISO certified:

- ISO 27001 – Information Management
- ISO 9001 – Quality Management
- ISO 14001 – Environmental Management

For more information, please visit [tivi.io](http://tivi.io)

**Smartmatic  
– managed  
elections  
across 5  
continents,  
processing  
almost 4  
billion votes**

**Cybernetica –  
developed the  
world’s first secure  
Internet voting  
system in Estonia  
used for 11 years  
in 8 nationwide  
Estonian elections**

Cybernetica is a R&D intensive cybersecurity company that has earned a reputation as a dependable provider of innovative e-Government solutions, often outclassing recognized international players. Cybernetica researches, develops and manufactures mission-critical systems for governments and corporations in more than 35 countries and has developed several world-renowned critical e-Government systems, such as the Estonian X-road interoperability ecosystem. Cybernetica developed the world’s first secure Internet voting system in Estonia, which is the most successful and long standing governmental online voting program in the world.

[www.cyber.ee/en/](http://www.cyber.ee/en/)

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