H.E.S.

HYBRID ELECTION SYSTEM

A New Era of Transparent, Secure Voting:

In an increasingly digital world, the bedrock of democracy – the election process – often grapples with challenges of trust, transparency, and efficiency. Traditional methods can be slow, prone to manual error, and difficult to audit, while purely electronic systems raise concerns about unverified digital trails.

H.E.S., a groundbreaking approach that marries the tangible security of paper ballots with the speed of modern digital technology, all powered by readily available hardware: a standard laptop and a webcam.

Crafted by MILLAWAVE in response to calls for election reform from advocates, reformers, and the public, H.E.S. is a groundbreaking system that reimagines election administration through a dynamic software platform. By embedding transparency, accountability, and voter empowerment at its core, it returns control to citizens, transforming how elections are managed and experienced.

H.E.S. empowers citizens with direct control over their votes, bypassing the influence of foreign technology. Because H.E.S. operates without centralized counting or data servers, there is no single point of entry for malicious actors.

This design ensures no central vulnerabilities exist, leaving nothing for hackers to compromise.

Election Voting Workflow Overview

PHASE 1: VOTING & VERIFICATION

- Paper Ballot Casting: Voters receive and mark pre-numbered paper ballots with fillable bubbles.
- Offline Scanning: Ballots are scanned via a webcam-connected, offline laptop using HES software.
- Private Verification: Voters review their ballot image and digital interpretation (e.g., "You voted for: Candidate 3") on a privacy-shielded screen.
- Correction: Voters fix errors (e.g., over-votes, misread marks) by shading bubbles directly on the ballot before resubmitting.
- VVPAT Print & Storage: After confirmation, a Voter-Verified Paper Audit Trail (VVPAT) is printed (containing vote details and a QR code). The paper ballot is stored securely in a sealed box as the legal record, while the VVPAT serves as a secondary audit trail.

PHASE 2: COUNTING & TALLYING (Post-Voting)

- Live Ballot Rescanning: Ballots are rescanned publicly via webcam, with real-time transparency.
- Dual-Screen Display: Voters' ballot images and digital interpretations are shown side-by-side for observers.
- Human Oversight: Election officers, with watchers, approve, reject, or dispute each ballot. Rejected/disputed ballots are manually adjudicated.
- Real-Time Tally: Valid votes are added to a public dashboard, displaying live tallies (candidate counts, percentages).

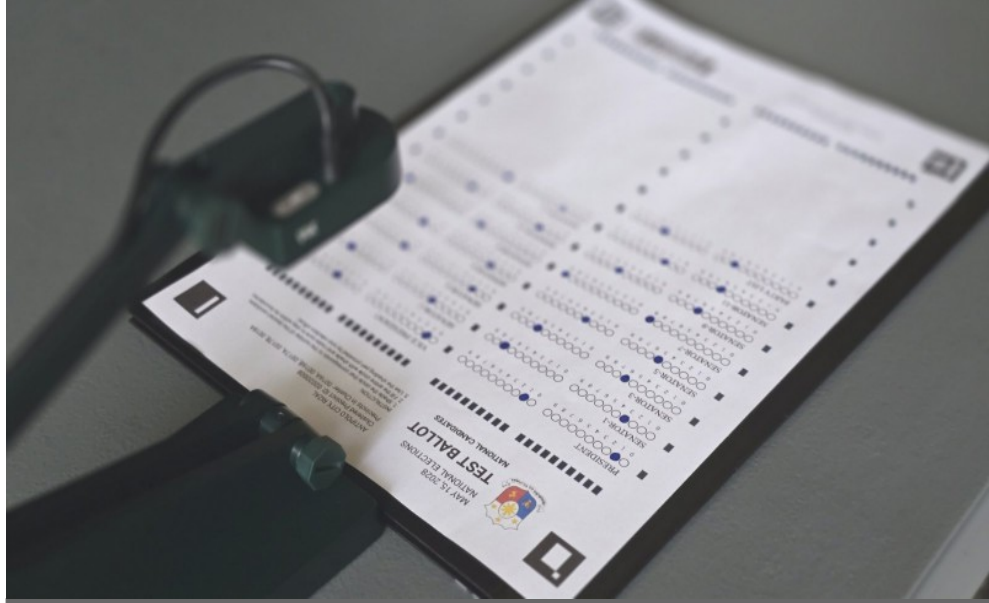
PHASE 3: RESULTS & TRANSMISSION

- Signed Election Return (ER): A final, legally binding document is printed, signed by election officers, party watchers, and IT supervisors.
- Data Authentication: ER and all records (ballot images, VVPATs, metadata) are stored locally. Transmission requires manual input of a unique code by an election officer, ensuring human-controlled verification.

Key Principles:

- Transparency: Real-time public viewing of ballot scanning and tallies.
- Security: Offline voting systems, tamper-evident storage, and manual oversight.
- Accuracy: Immediate voter verification and human decision-making in dispute resolution.
- Legal Integrity: The paper ballot is the definitive vote record, with VVPAT and ERs as audit safeguards.

HES uses a decentralized mesh (peer-to-peer) network instead of a central server, where each precinct laptop acts as a node. These nodes automatically sync election data—like ballots and reports—over cellular, Wi-Fi, LAN, or satellite connections. Data is replicated across thousands of nodes nationwide, eliminating single points of failure and reducing hacking risks. If one node is compromised, the system detects discrepancies, alerts authorities, and maintains integrity through consensus across the network—making it highly resistant to cyberattacks and insider threats.



H.E.S. is a comprehensive election software environment that seamlessly integrates traditional and modern methodologies to enhance transparency, security, and public trust.

Its unique approach fosters a powerful synergy between human and machine intelligence, leveraging cutting-edge technologies such as AI image processing and machine learning to significantly boost its capabilities. Additionally, H.E.S. employs a decentralized system for the distribution of election results.

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Aggregation & Dissemination

Distributed peer-to-peer Transmission: The official digital results from each precinct, along with the signed paper printouts, are then circulated electronically to higher levels for canvassing. This transport isn't reliant on a central server; instead, the broadcast of results occurs via a secured Distributed Mesh Network. Every laptop used in every precinct also functions as a node in this network, creating a robust, immutable, and highly resilient ledger that is extremely difficult to tamper with.

Real-time Public Website: Concurrent with blockchain data circulation, each precinct laptop also gains access to a user-friendly website portal. This portal delivers real-time, aggregated results, offering granular detail from the national level down to regional, provincial, city, municipal, barangay, and even individual precinct levels.

Interactive Transparency Map: The website portal features an intuitive map interface, allowing the public to visually navigate the election results. Every dot on the map represents a specific precinct, and clicking on it reveals comprehensive details:

- Precinct number
- Name of the person/s in charge
- Result and broadcast timestamp
- GNSS location
- IP address and MAC address of the precinct device
- Data, image, send, received and size, and other relevant technical details.

The Digital Backbone

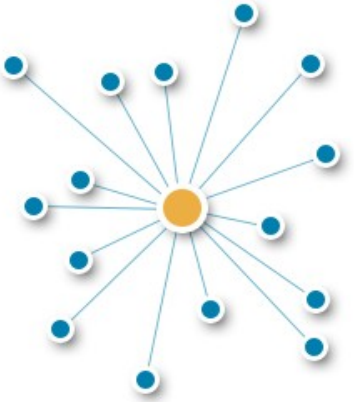
A significant advantage of a peer-to-peer-powered distributed network within H.E.S. lies in its inherent security and resilience compared to the centralized networks common among most automated election vendors today.

Unlike a single server or database that presents a tempting and vulnerable target for malicious actors, a blockchain type distributes vote records across numerous interconnected nodes.

This decentralization eliminates the single point of failure inherent in current systems, making it significantly more resistant to hacking, denial-of-service attacks, and data manipulation.

Furthermore, the cryptographic immutability of blockchain ensures that once a vote is cast and recorded, it cannot be altered or deleted without detectable consensus from the entire network, providing an unprecedented level of data integrity and auditability that is virtually impossible to achieve in a proprietary, opaque centralized model.

This transparency and tamper-proof nature fosters greater public trust and allows for real-time, independent verification of election results, directly addressing the critical vulnerabilities and trust deficits associated with relying on centralized systems that are perpetually prone to external and internal compromise.



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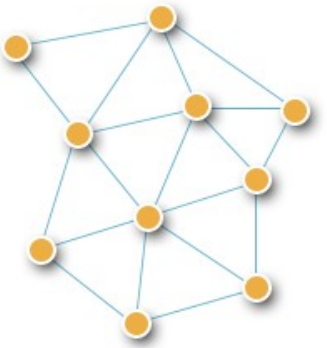

DISTRIBUTED

The above illustrations clearly differentiate between two distinct network architectures for handling election results.

Centralized Network: each blue circle signifies an ACM/VCM, with all devices transmitting their election data to a single, central server represented by the yellow circle. This configuration highlights a singular point of data aggregation.

Distributed Network: all yellow circles denote laptops that have our H.E.S. software installed, enabling them to function as individual nodes. With an estimated over 300,000 such nodes potentially spread across the country, this distributed configuration is designed to be virtually impossible to compromise, offering robust security against any hacking attempts.

Why H.E.S. matters

H.E.S. represents a significant leap forward in election technology, addressing critical needs in modern democracies:

- Unparalleled Transparency & Auditability: The combination of voter-verified physical ballots, public live scanning, and blockchain-secured digital records creates multiple layers of verification. Every step is open to scrutiny, from the individual voter to public observers and technical experts.
- Enhanced Security: The hybrid nature mitigates risks. A physical paper trail protects against purely digital vulnerabilities, while blockchain technology provides a tamper-proof, distributed ledger for electronic results, making widespread fraud virtually impossible.
- Increased Voter Confidence: By allowing voters to see their ballot interpreted before it's dropped, the system directly addresses concerns about misinterpretation or manipulation, fostering greater trust in the process.
- Cost-Effective & Scalable: Utilizing standard laptops and webcams significantly reduces the cost barrier often associated with specialized election equipment, making advanced electoral technology accessible even in remote or resource-constrained areas.
- Real-time Accessibility: The interactive web portal democratizes access to election results, empowering citizens with immediate, verifiable data at every level of detail.

H.E.S. isn't just an upgrade; it's a paradigm shift. By embracing off-the-shelf technology in an intelligent, multi-layered design, it promises to deliver elections that are demonstrably more secure, transparent, and trustworthy, setting a new global standard for democratic processes in the digital age.

Other Consideration

H.E.S. also presents a compelling alternative to traditional foreign-based vendor vote counting machines, primarily due to its inherent cost-effectiveness and versatile utility after elections.

Unlike specialized, single-purpose ACMs/VCMs that become idle once votes are tallied, the core equipment of the H.E.S standard laptop computers, large LCD screens, and Webcam can be seamlessly repurposed for classroom instruction by the very schools hosting polling places, transforming election expenditures into valuable educational assets.

This dual functionality translates into substantial savings, as the acquisition cost of these widely available components is dramatically lower than that of proprietary ACMs/VCMs, which, by their very nature, offer no secondary application and often incur the significant burden of costly warehousing.

Crucially, H.E.S. offers a significant advantage by eliminating the reliance on expensive, lock-in, Telco-based VPN SIM packages. This fundamental design choice drastically reduces operational costs, while simultaneously enhancing the accessibility and scalability of secure election result reporting across even the most diverse geographical locations.

Unlike traditional solutions, H.E.S. only requires regular public internet connectivity, making it incredibly flexible and easy to deploy. Furthermore, and critically for sensitive applications, its robust process and design architecture is engineered to be immune to hacking threats, ensuring the utmost integrity and security of the reported data.

Furthermore, the H.E.S. system extends its economic advantages to consumables and operational logistics; it utilizes standard A4-sized ballot paper, significantly cheaper to print than the specialized ballots required by foreign systems.

It is crucial to understand that the H.E.S. is fundamentally distinct from a commercial vendor, a proprietary product, or merely another solution provider. Instead, H.E.S. stands as a robust platform, conceptually engineered and meticulously developed to directly confront and resolve the myriad challenges and persistent issues that have historically plagued existing electoral methodologies and systems used in countless past elections.

The very genesis of H.E.S. lies in a unified and groundbreaking collaboration, drawing upon the diverse and invaluable expertise of IT professionals, former COMELEC officials, seasoned government ICT leaders, military IT experts, independent observers, electoral analysts, and reform advocates from various societal sectors.

This broad-based synergy was the catalyst, forging the functional concept and workflow of H.E.S. with a singular purpose: to deliver a transparent, accurate, and trustworthy electoral process, thereby explaining precisely why H.E.S. was conceived and brought into existence.

THANK YOU

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