SaTC: CORE: Small:
A Robust Framework with Rigorous Semantics and Security Guarantees for Election-Day Voter Check-in

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Challenge:

- Guaranteeing "**One voter, one vote**"
- Research on election systems focuses on vote tabulation and election audits and slights voter check-in problem
- Commercial e-pollbooks systems are immature and replete with problems
- **Voter check-in systems** must be robust, dynamic, scalable, correct, auditable and secure
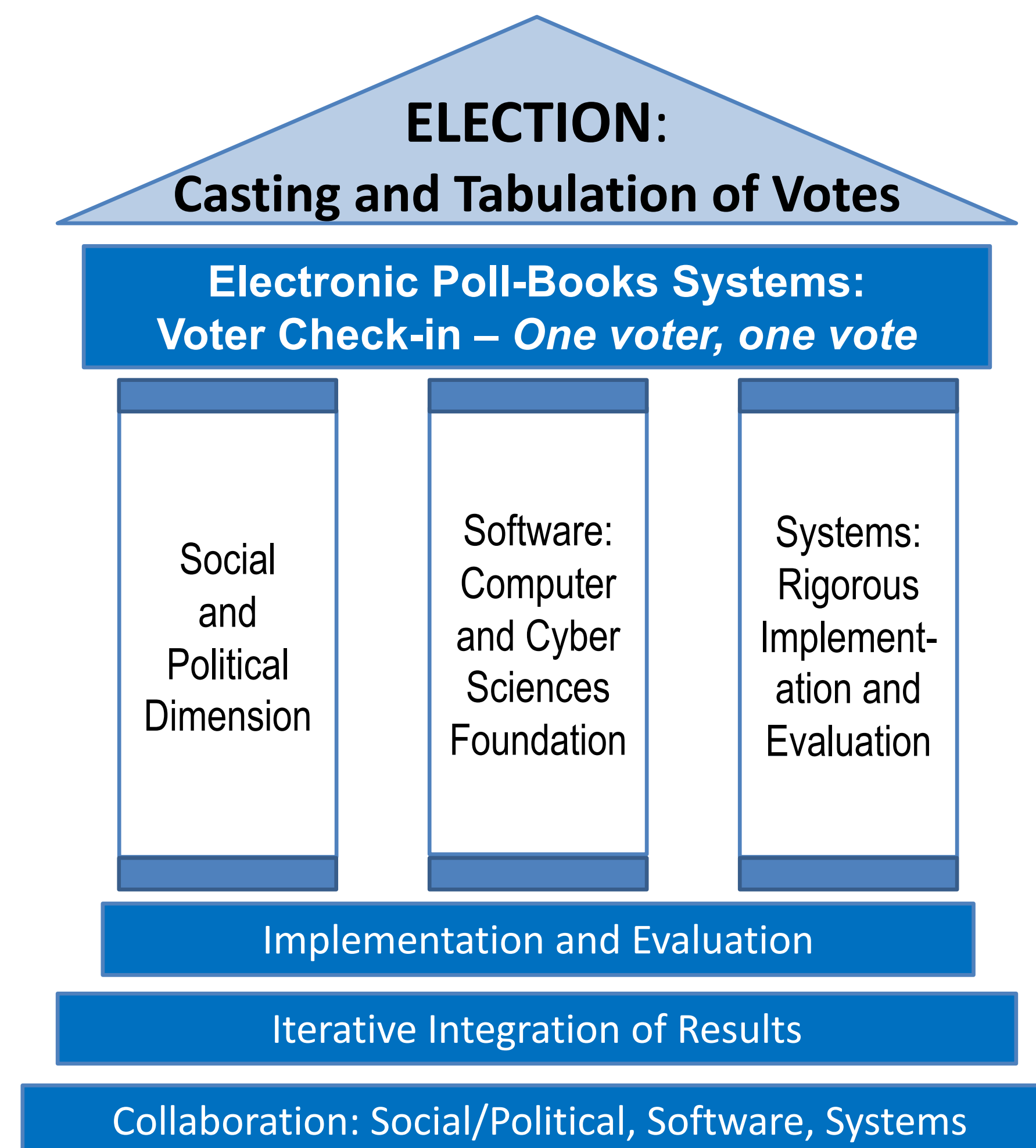
Solution:

Research and prototype a check-in system with "one voter, one vote" guarantee, ensuring correctness, security, fault-tolerance, and performance

- Foundations: efficient agreement under resource constraints, application of blockchains for audits, self-structuring and secure wireless networks, multi-source transfer learning-based IDS, human-assisted fault-tolerance
- Systems: distributed architecture, intrusion detection using ML, formal audit log analysis, secure communication, failure detection, integration
- Social/political: (a) Presented a study "In Cyber We Trust? Understanding Election Integrity in the Age of E-Voting", (b) survey of election administrators designed, approved for summer 2022, (c) planning survey of voting age population

ELECTION: Casting and Tabulation of Votes

Electronic Poll-Books Systems: Voter Check-in – *One voter, one vote*

Social and Political Dimension | Software: Computer and Cyber Sciences Foundation | Systems: Rigorous Implementation and Evaluation

Implementation and Evaluation

Iterative Integration of Results

Collaboration: Social/Political, Software, Systems

Scientific Impact:

- New integrated approach to dynamic and secure distributed systems, autonomous intrusion detection, fault isolation, and auditability for electronic pollbooks
- Robust algorithms for models of failure beyond the traditional constraints, using human-assisted computing when needed
- Motivate additional research on electronic election systems
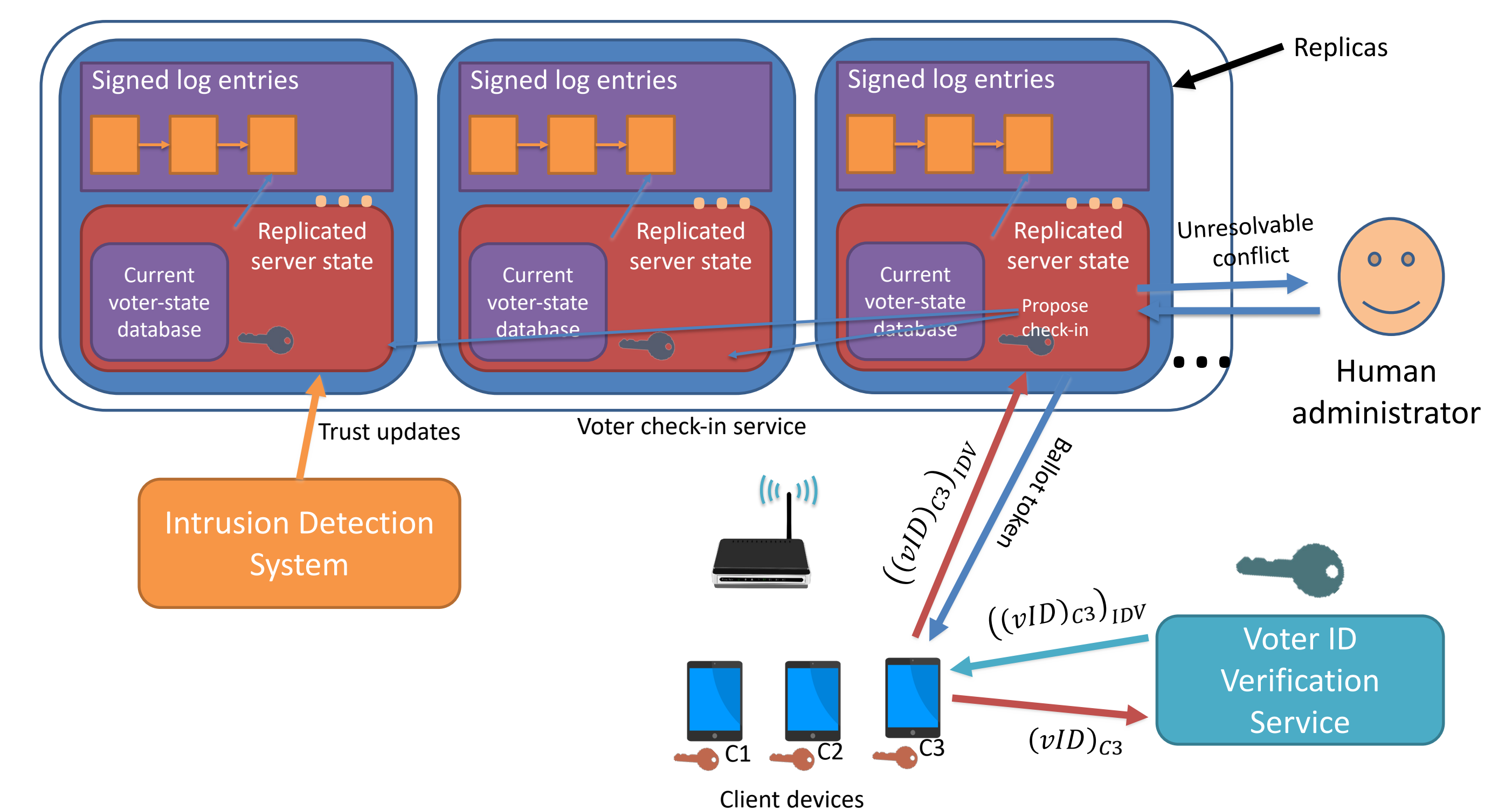

Impact on Society:

- Robust and auditable voter check-in guaranteeing "one voter, one vote"
- Development of a reference e-pollbook implementation
- Include inputs from, and analysis of surveys of voters and election officials
- Increasing the confidence of voters in the correctness of political election outcomes

Education and Outreach:

- The project involves graduate students in research and implementation
- Graduate and undergraduate students involved in the projects will learn about the security and privacy issues in electronic election systems
- Outreach to election officials and poll workers in Augusta, Georgia

Broader Participation:

- The project includes social/political studies that involving voters and election officials
- Survey will obtain inputs from relevant constituencies
- Analysis of surveys will guide the technical development and used for evaluation and assessment
- Augusta University students will participate in system evaluation