The Evolution of Blockchain Security

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We’ve Come a Long Way…

Bitcoin → Ethereum → The DAO

App-Ecosystem
- Uniswap
- Maker
- Compound

Base-Layer

Dependencies
Complexity

Tooling
Compartmentalization
Standardization

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SECURITY IS NOT JUST CODE!

“Weakness in an information system, system security procedures, internal controls, or implementation that could be exploited or triggered by a threat source.”

- NIST Vulnerability definition
CONSIDERATIONS FOR SMART CONTRACTS DEVELOPMENT
## What Can Go Wrong with Code, and How to Mitigate

<table>
<thead>
<tr>
<th>ISSUE</th>
<th>EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory safety</td>
<td>Overflows, underflows, dangling pointers</td>
</tr>
<tr>
<td>Input validation</td>
<td>Code injection, format string hacks, sql injection, etc.</td>
</tr>
<tr>
<td>Privilege escalation flaw</td>
<td>Access controls</td>
</tr>
<tr>
<td>Fundamental design flaws</td>
<td>Denial of Service (DoS)</td>
</tr>
<tr>
<td>Side channel attacks</td>
<td>Timing attacks</td>
</tr>
<tr>
<td>Cryptographic vulnerabilities</td>
<td>Insecure key storage, randomness of keys</td>
</tr>
</tbody>
</table>

### MITIGATION

- Threat modelling
- Audits
- Testing
- Fuzzing
Secure Smart Contract Code!? 

LEARNINGS

Frequency and nature of vulnerabilities for smart contract code and normal code is similar, but:

- What you read about does not necessarily equate to what you should be worried about
- A lot of the findings (almost 49%) are almost impossible to imagine detecting with a tool or testing

Smart contract development is the opposite from agile!
A Comprehensive Checklist for Smart Contract Development

PARITY TECHNOLOGIES
14 POINT CHECK LIST

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Highlights from the Check List

**GitHub and Repo Structure**
- Create a new GitHub organization
- Put every contract in a separate repo
- Embed dependencies

**Deployment**
- Actual deployed state of each contract should live in a protected `master` branch
- Every contract should have a README that lists its deployment addresses in all networks

**Code Quality**
- Make sure that bugs related to syntax quirks and misunderstandings are discoverable with tests by using a different language
- Reviews should be required for pull requests
Beyond Code: Security in a Developing Interdependent and Open Ecosystem

SOME OBSERVATIONS

- More and more projects are rolling their own chains vs. “Don’t roll your own crypto!”
- Limitations in scalability: Chains are competing for security
- Limitations in framework: App ecosystem is developing complex interdependencies

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SOLUTIONS AND CONSIDERATIONS
GOING FORWARD
Naive Scaling: Fractured Security and Weak Interoperability
Better Scaling: Pooled Security and Strong Interoperability
Moving On from a One-size-fits-all Approach...

SHARDED BLOCKCHAIN

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Achieving Customization and Compartmentalization

HETEROGENOUS MULTICHAIN

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Build a Structured Framework to Ease Development and Close Security Holes

- Customizable runtime models vs. one-size-fits-all Turing complete virtual machines
- Resort to standards like Wasm and “safer” languages like Rust
- On-chain governance in case of ultimate failure
What Blockchain Can Learn from Other Industries

Aerospace  Medicine  Hardware  Communication  Open Source
Key Takeaways

- Security is more than code
- Smart contracts aren’t secure
- Don’t roll your own blockchain
- Be humble and learn from other industries
- Security is hard and we’re in this together