The Evolution of Blockchain Security

PRESENTER

Jutta Steiner, CEO & Co-Founder, Parity Technologies

PhD Mathematics, University of Bonn

Ex-Chief Security, Ethereum Foundation

Guardian (Advisor), matrix.org Foundation

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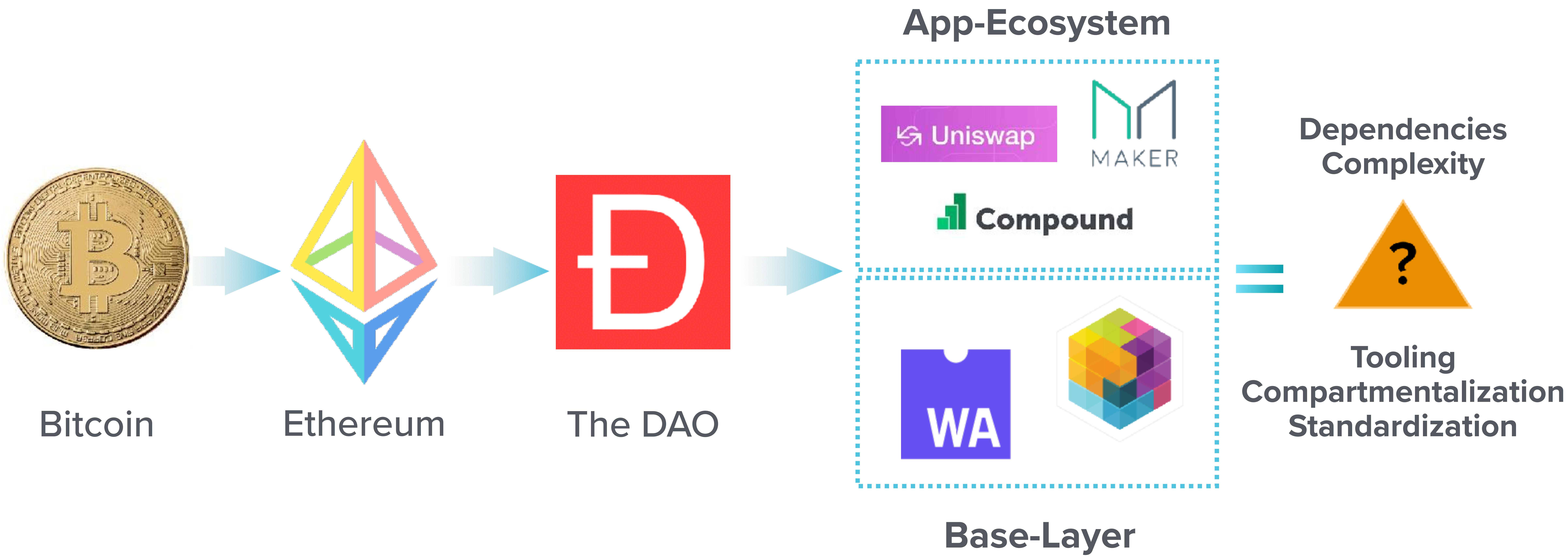
We’ve Come a Long Way…



Bitcoin

Ethereum

The DAO

App-Ecosystem

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

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

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!

ToB Report: https://blog.trailofbits.com/2019/08/08/246-findings-from-our-smart-contract-audits-an-executive-summary/

A Comprehensive Checklist for Smart Contract Development

PARITY TECHNOLOGIES 14 POINT CHECK LIST

https://www.parity.io/paritys-checklist-for-secure-smart-contract-development/

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

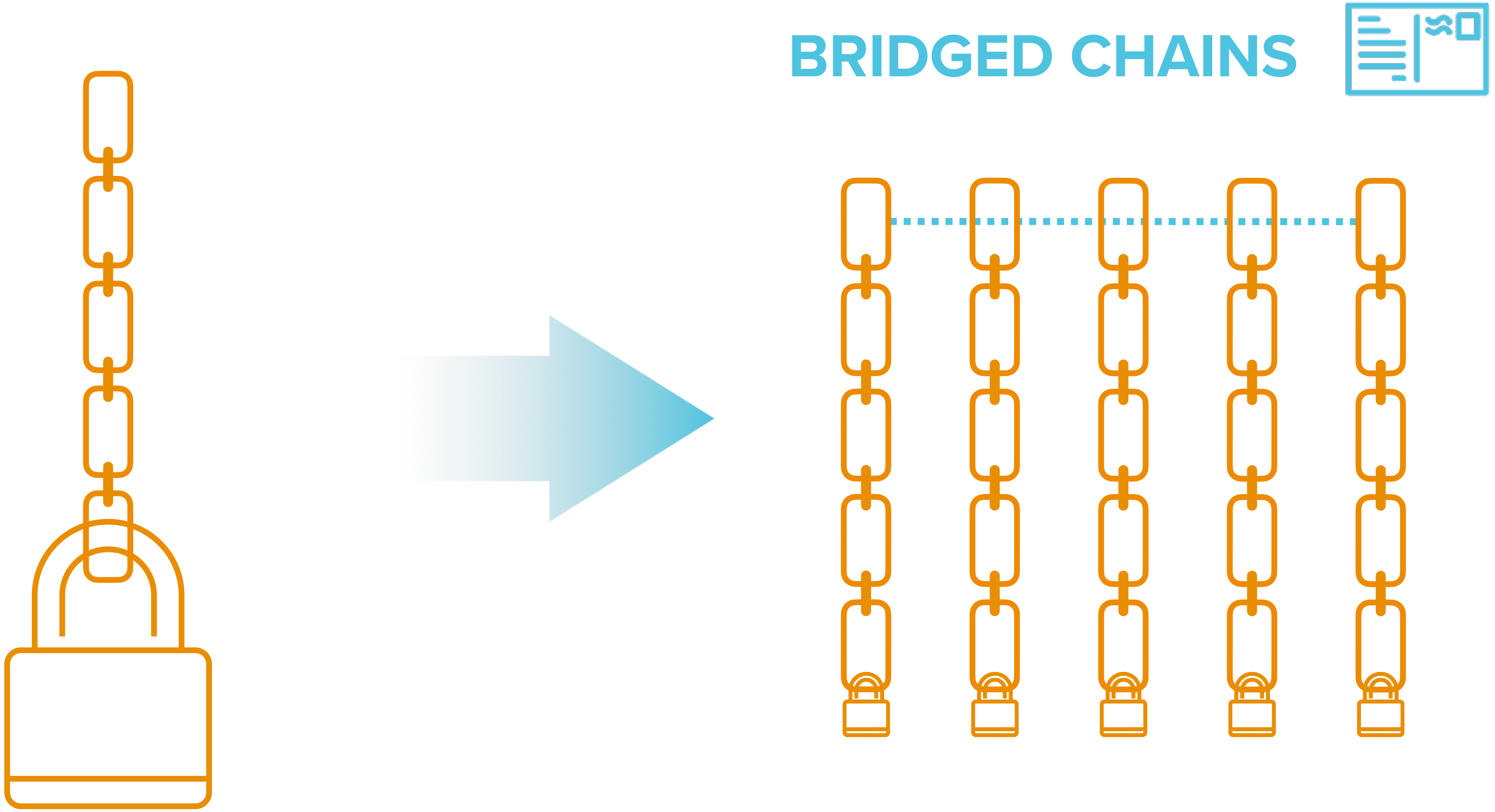
Beyond Code: Security in a Developing Interdependent and Open Ecosystem

SOME OBSERVATIONS

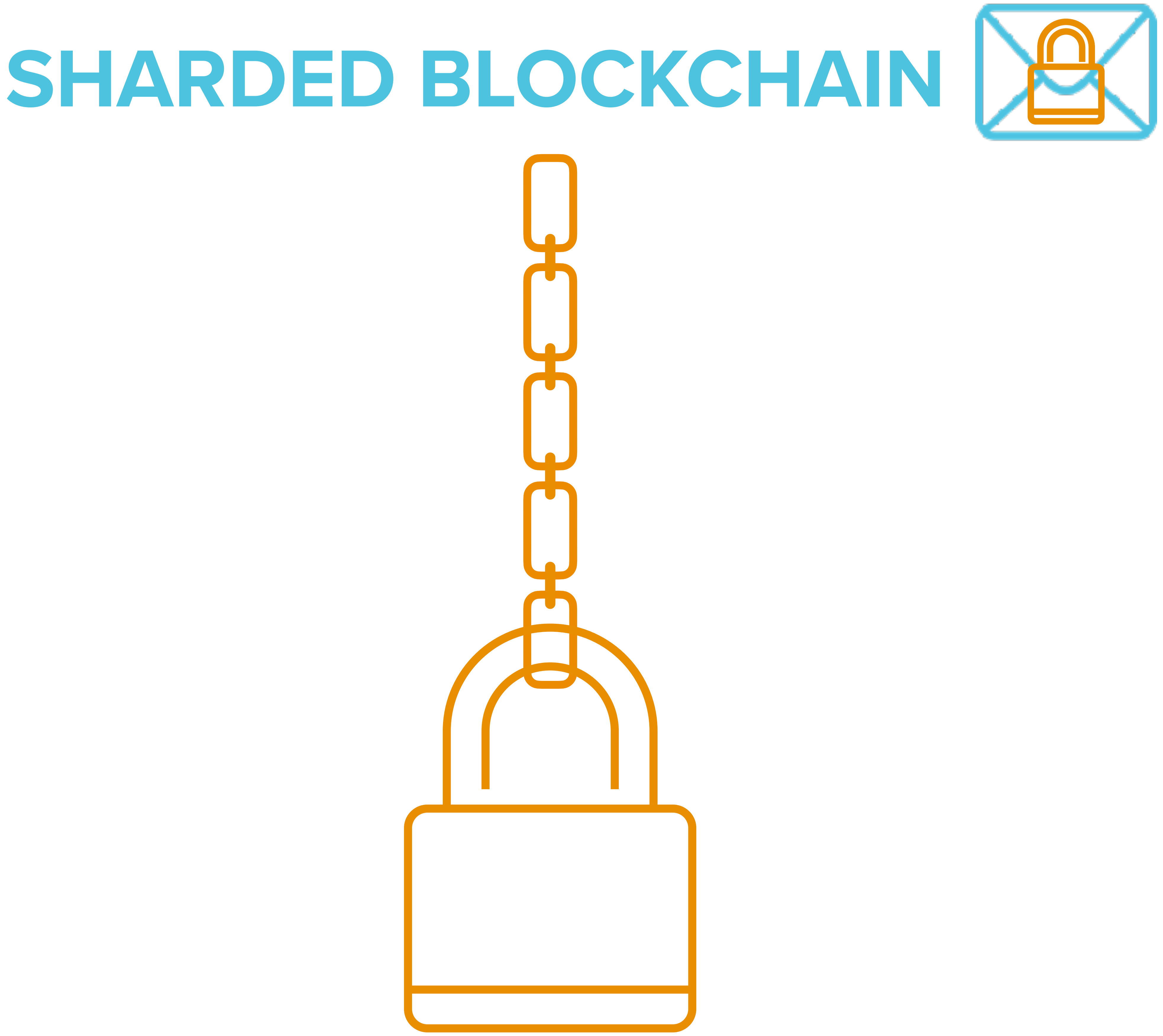
- More and more projects are rolling their own chains vs. “Don’t roll your own crypto!”
- Limitations in scalability: Chains are competing for security
- Limitations in framework: App ecosystem is developing complex interdependencies

SOLUTIONS AND CONSIDERATIONS GOING FORWARD

Naive Scaling:
Fractured Security and Weak Interoperability



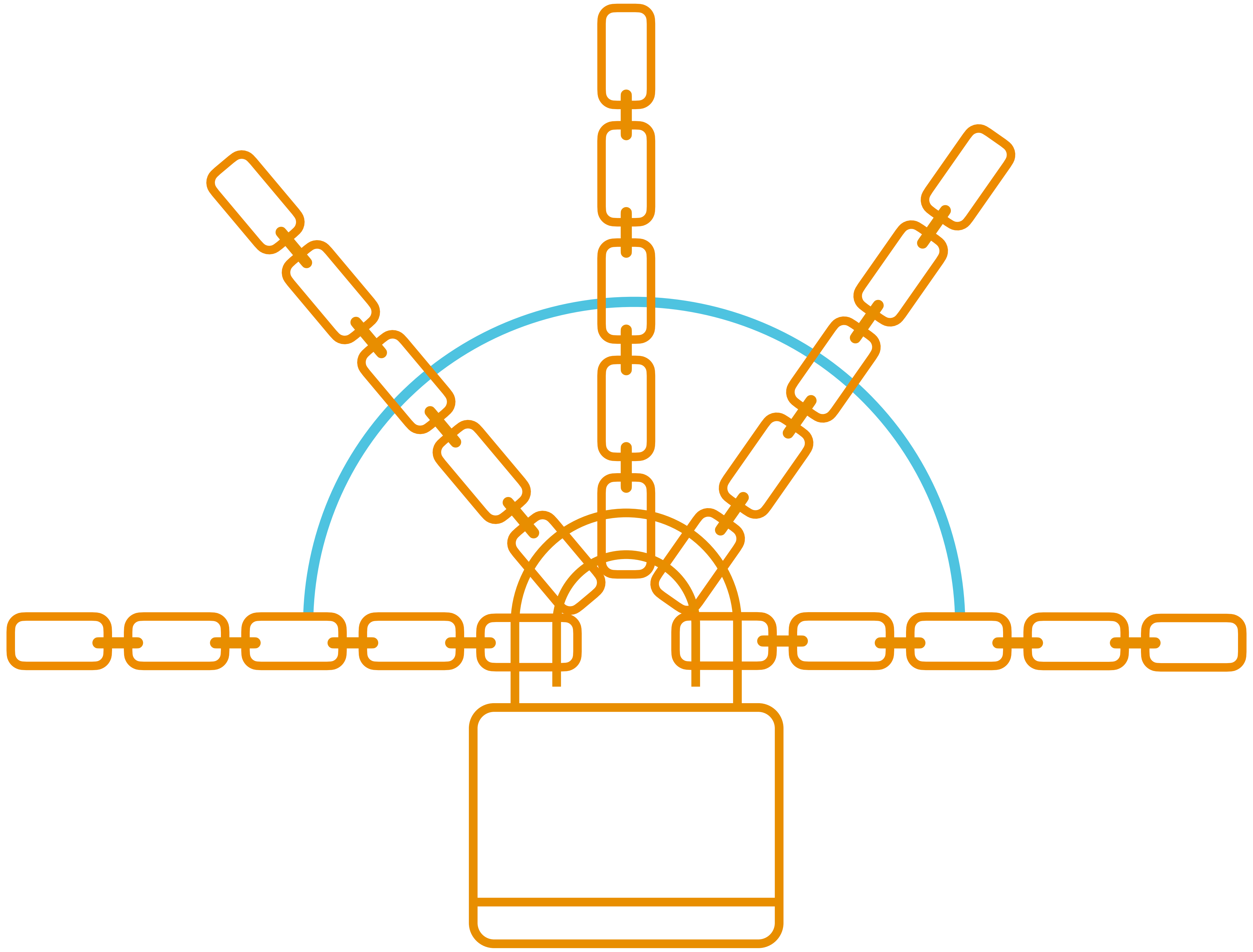
Better Scaling: Pooled Security and Strong Interoperability



SHARDED BLOCKCHAIN

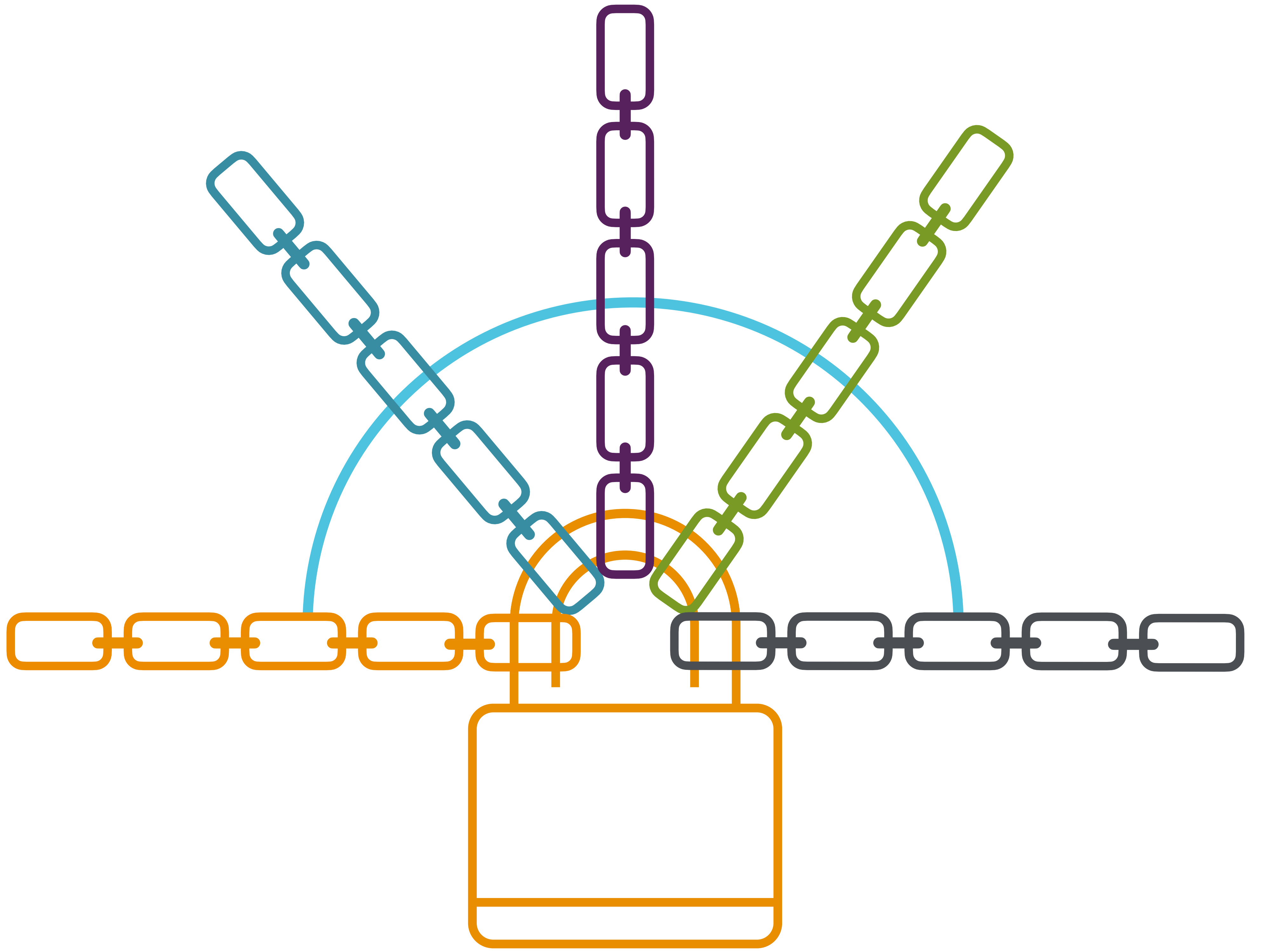
Moving On from a One-size-fits-all Approach…

SHARDED BLOCKCHAIN

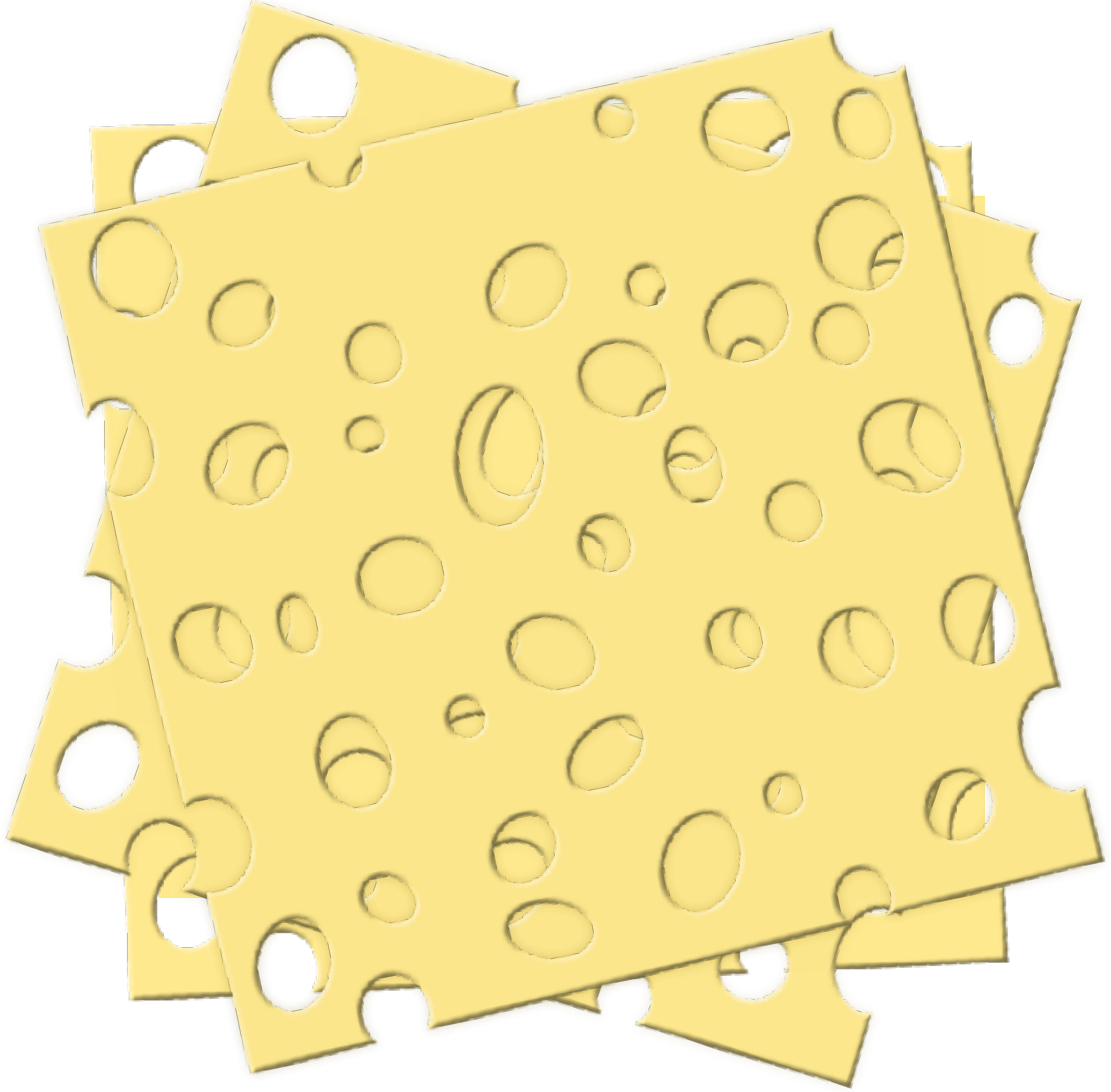


Achieving Customization and Compartmentalization

HETEROGENOUS MULTICHAIN



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 a16z

[CRYPTO STARTUP SCHOOL]