"Risk" in an untrusted setting

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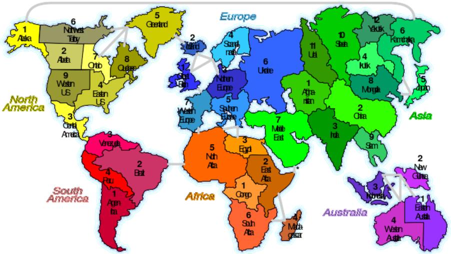
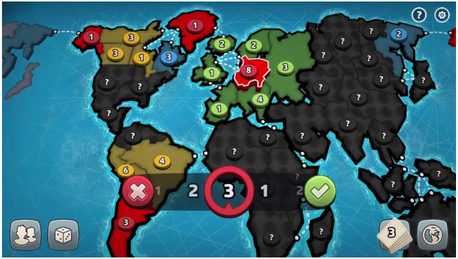
Risk

- *Risk* is a popular strategy board game.
- It is played on a single board, depicting a world map, partitioned into regions.
- A player owns a region of the map by stationing troops within the region.
- Players fight for regions by gambling some of their troops against the troops in the other player's region.



Risk

- *Risk* has a variant called ”fog of war”.
- In this variant, players can only see the number of troops stationed within regions they neighbour.
- This variant is therefore only played online, in a **trusted setup**.



Proposition

- Play fog-of-war Risk in an untrusted setup.
- In the untrusted setup, the same guarantees should be made as the trusted setup, but on a peer-to-peer network.

Rationale

- **Federation**
  - Federated platforms can have longer lifespans than centralised platforms.
  - Federated platforms are more resistant to censorship and can help promote anonymity and privacy.
  - Federated platforms encourage user freedom.
- **Security**
  - Constantly looking for ways to secure against threats specific to federated and decentralised infrastructures.
  - Security issues can be devastating even to decentralised infrastructures.

State of the art

- Private key encryption.
- Signatures.
- Additive homomorphic encryption.
- **Web platform**. Rapidly evolving.
- **Monero, Zcash**. Decentralised ledgers respectively using the *Bulletproof* and *ZK-SNARK* zero-knowledge proof systems.

Results

Emulated P2P environment using WebSockets.

Results

Produce shared random values without beacons using commitment schemes.

Results

Generating large primes using ECMAScript `BigInt` and Rabin-Miller.

Results

Implementation of the Paillier additive homomorphic cryptosystem.

Results

Implementation of Risk.

Citations

Image Risk game board by CMG Lee, the asterisk denoting the missing link in the 40th Anniversary Collector's Edition, based on shapes from http://commons.wikimedia.org/wiki/File:Risk_board.svg. 11 November 2008. CC-BY-SA 4.0