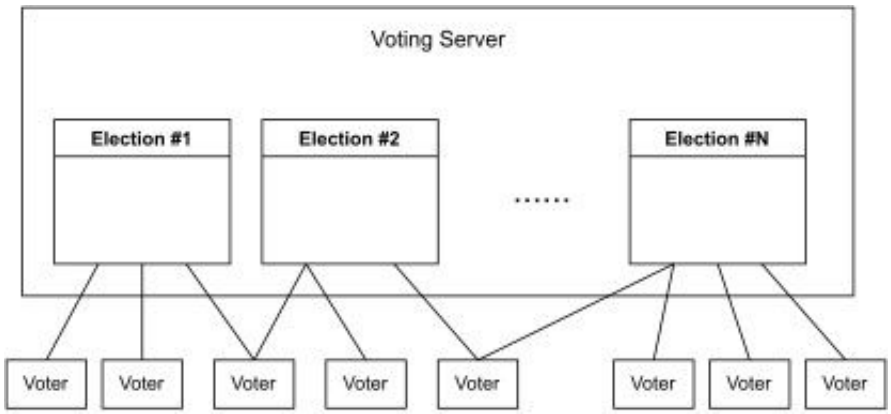
(FTC) Online Electronic Voting – Part II. Single-Node e-Voting Server

In the project, you need to implement the voting logic of the e-Voting server. In this part of the project, we assume that there is just one voting server. Every voter will be connecting to the voting server to participate in the elections.



A. Local Server API

`RegisterVoter(Voter) returns (Status)`

You can register a new Voter with the RegisterVoter API.

Return Value

Status.code=0 : Successful registration

Status.code=1 : Voter with the same name already exists

Status.code=2 : Undefined error

Parameters

Voter.name : Name of the voter (e.g., “王大明”)

Voter.group : Group of the voter (e.g., “同學”)

Voter.public_key: The voter's ed25519 public key (based on the libsodium implementation).

`UnregisterVoter(VoterName) returns (Status)`

This API is used for unregistering a voter with the name VoterName.

Return Value

Status.code=0 : Successful unregistration

Status.code=1 : No voter with the name exists on the server

Status.code=2 : Undefined error

Parameters

VoterName : Name of the voter (e.g., “王大明”)

B. RPC APIs

`rpc PreAuth (VoterName) returns (Challenge)`

`rpc Auth (AuthRequest) returns (AuthToken)`

Most of the RPC APIs require an authentication token to distinguish the identity of the voter client. The authentication token can be acquired by calling `PreAuth(VoterName)`, where the VoterName is the name of the voter client. The server will return a Challenge.

The voter client will they reply to the Challenge with AuthRequest, where

AuthRequest.name is the name of the voter client.

AuthRequest.response is the detached signature of Challenge.

On the server-side, the server needs to verify if AuthRequest.response is a valid signature by the voter's ed25519 secret key. If the AuthRequest.response is valid, the server will return a random and unique authentication token AuthToken back to the client.

An authentication token will be expired after **one hour** since its creation (as returned by `rpc Auth()`), and the voter client needs to perform the authentication process again to get a new authentication token.

It is the responsibility of the server to keep track of the authentication tokens of active client sessions. The server needs to keep the mapping between the client identity and the current authentication token.

`rpc CreateElection (Election) returns (Status)`

A registered voter client can create a new election on the sever by calling `CreateElection (Election)`, where

Election.name: The name of the election (e.g., "學生會會長選舉")

Election.groups: The list of groups eligible to participate in the election (e.g., {"大學部學生", "研究所學生"})

Election.choices: The list of choices (e.g., {"林帥哥", "鄭美女"}}

Election.end_date: The date and time when the election will be closed (e.g. `2023-01-01T00:00:00Z`)

Election.token: The authentication token.

Return Value

Status.code=0 : Election created successfully

Status.code=1 : Invalid authentication token

Status.code=2 : Missing groups or choices specification (at least one group and one choice should be listed for the election)

Status.code=3 : Unknown error

`rpc CastVote (Vote) returns (Status)`

A registered voter client can cast a vote in an ongoing election on the server.

A voter client can only cast once in each election.

Return Value

Status.code=0 : Successful vote

Status.code=1 : Invalid authentication token

Status.code=2 : Invalid election name

Status.code=3 : The voter's group is not allowed in the election

Status.code=4 : A previous vote has been cast.

Parameters

Vote.election : Name of the election (e.g., "學生會會長選舉")

Vote.choice_name: The choice (e.g., "林帥哥")

Vote.token: The authenticaiotn token

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rpc GetResult(ElectionName) returns (ElectionResult)
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One can query the result of a completed election by calling `GetResult(ElectionName)`.

Return Value

When the query is successful

ElectionReuslt.status = 0

VoteCount.counts: The list of choices and the ballot counts

When the query is unsuccessful

ElecttionResult.status = 1: Non-existent election

ElectionResult.status = 1: The election is still ongoing. Election result is not available yet.

Parameters

ElectionName: Name of the election to be queried

Please prepare the following for submission

1. Put your code on GitHub
2. Prepare a README describing how to build and run your code
3. Write a report that cover the design, implementation, and evaluation