THE HEBREW
UNIVERSITY
OF JERUSALEM

Advanced Topics In Online Privacy and Cybersecurity

Public Key Infrastructure

06/06/2022

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API

We have 3 different modules in our program, but the CA module is fully controlled by the Entity module, as we chose to wrap every CA with an Entity class. The modules uses sockets to communicate and you can add calls in main.py.

We have a an assumption int the project that who ever requests to be a ca nor requests a certification, we will give without performing any checks.

- entity/server.py - the server wraps the Entity class and lets us interact with it using sockets. We will describe each call:
  1. create_entity - creates an entity object with a given name
  2. sign - sign a message with the entity's private key
  3. request_cert - returns the entity's cert
  4. make_root_ca - turns the entity into a root ca
  5. is_ca - returns a boolean
  6. get_cert - returns the entity's certification
  7. pk - returns the entity's public key
  8. generate_cert - generate and signs a certificate for the entity, need to provide a signer
  9. revocate - revocates a cert, more details about revocation below
  10. check_if_revocated - returns a boolean

- validator/server.py - the server wraps the Validator class
  1. create_validator - creates a validator object
  2. verify - verify specific message with signature and public key
  3. add_root_ca - adds a ca as a root ca to the list of the validator
  4. validate - checks if a cert is validated by a root ca or a child of him

Design

entity.py - An entity can be anything in our network, a little e-commerce site or the root ca of the network. The Entity class and the CA class have a “composition” relations. If an entity is also a ca (in our case, anyone can be without any validation) then it has a field ca which points for a CA object.

ca.py - CA can generate a cerificate for the entity and can sign it with his own secret key. You can also add certificates to the revocation list of a ca.

validator.py - Validator class saves a list of root CAs and can recursively check if an entity is a ca or not. Also can check if any of the CAs from the entity path to the root has been revocated the cert or not.

Modules

- pickle
- socket
- re
- sys
- cryptography
- _thread
- date

Revocation

Each CA saves a list of the certificates that he has been revocated.
When ever a validator validates a cert, it checks on all of the CAs in the list if the certificate is in their revocation list.
If a certificate is expired it will be removed from the revocation list.

Server

The server.py files wraps the entities and provides them with a way to communicate with multiple objects. Each server gets his port as a sys argument and runs the server, they can communicate with each other for validation and other actions.

For each server you can add code in his own main in order to perform actions at runtime, and as well connect using a python socket and perform actions.