Applying Homomorphic Encryption in the Cloud

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Contribution

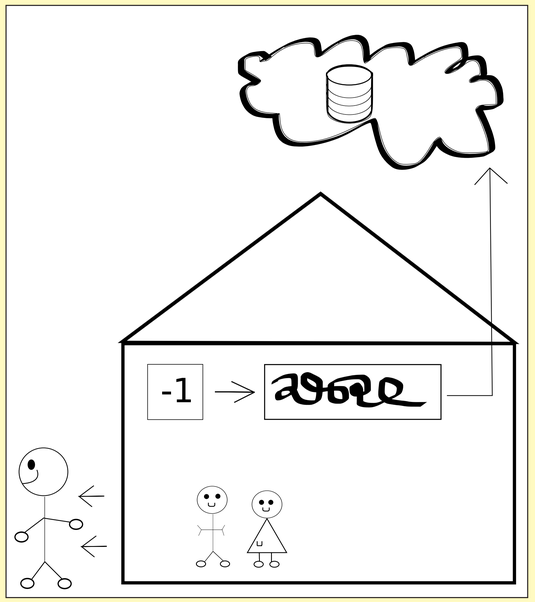
This work proposes an implementation of a client-server architecture based software that uses HElib to enable homomorphic encryption and perform computations on encrypted data.
The software is used to address the situation in the presented case study.

Objectives

- Establish a client-server architecture where homomorphic encryption can be applied.
- Identify which factors pose a challenge to apply homomorphic encryption in the cloud.
- Collect performance data on the use of homomorphic encryption.

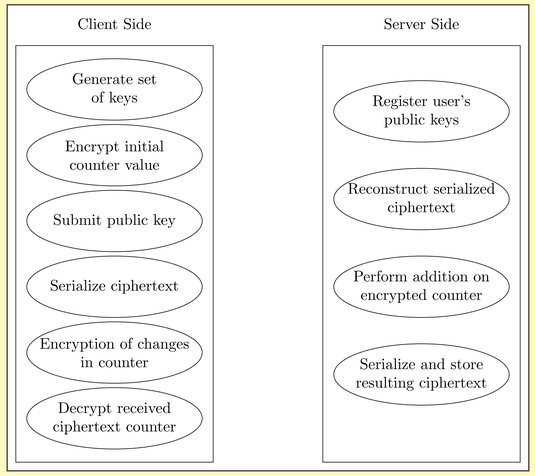
Case Study

Consider a scenario where a household has an expected pattern of activity, so that the resident seeks to ascertain the number of people inside at any time.
As the resident chooses to store the value of the counter in the cloud, he quickly realizes he does not want others to learn of this value, not even the cloud service itself, as to prevent potential burglars to break in when the household is empty.

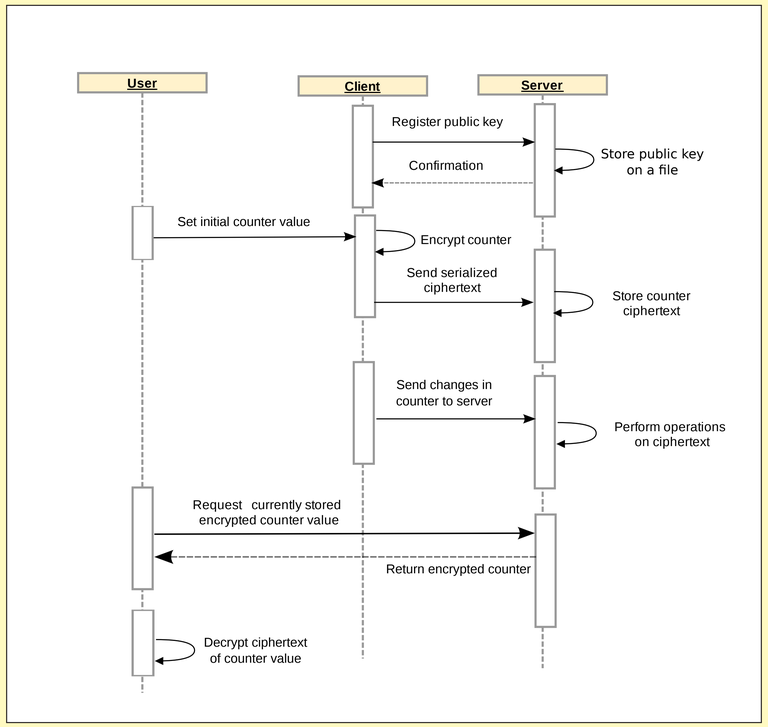


Methodology

A client-server architecture was designed and implemented in C++ to address a solution for the presented case study. Homomorphic encryption is enabled by using HElib [INSERTAR CITA]. Relevant tasks were divided between client and server.

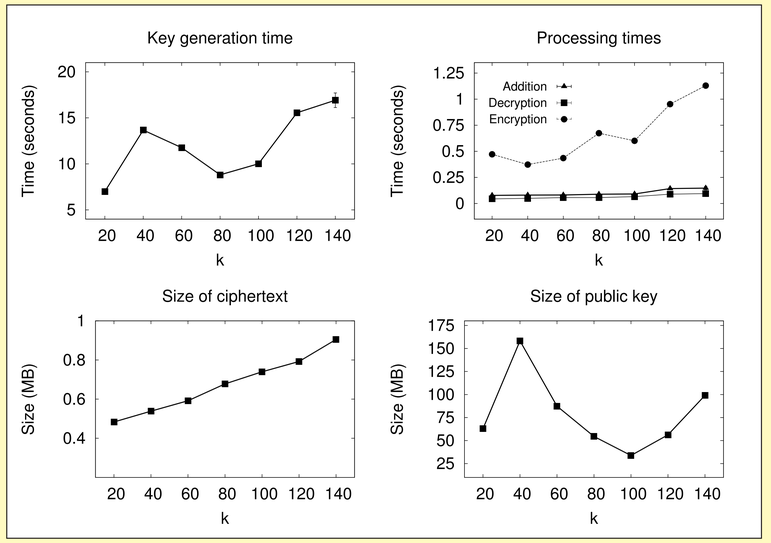


Operation Flow



Experimentation & Results

The performance of the system was evaluated by running 20 iterations with distinct values of a security parameter k needed for the homomorphic encryption scheme.
The system was evaluated in terms of ciphertext and key size, as well as the time needed for key generation and processing (addition, decryption, encryption).



Conclusions

References

Acknowledgements

Source Code

https://github.com/antoniosv/homomorphic-counter