Searchable encryption An alternative to surveillance

Ning Luo

Outline

Debate over surveillance

Searchable encryption

Searchable encryption Implementation

Debates over surveillance

Privacy Vs. Security

The leaks in 2013 by Edward J. Snowden

Many technology companies add encryption to their products and services

Tension between security and privacy

Congress approve six-year extension of surveillance law, section 702.

Debates over surveillance

Look forward, what about next 6 years?

"People, even for people from foreign country, should be assumed to be trustworthy and worthy of respects, instead of criminals, "

The possibility to abuse Section 702

Bulk collection approach can also damage security

Ignoring some of the ways these capabilities might allow the public to have the best of both worlds:

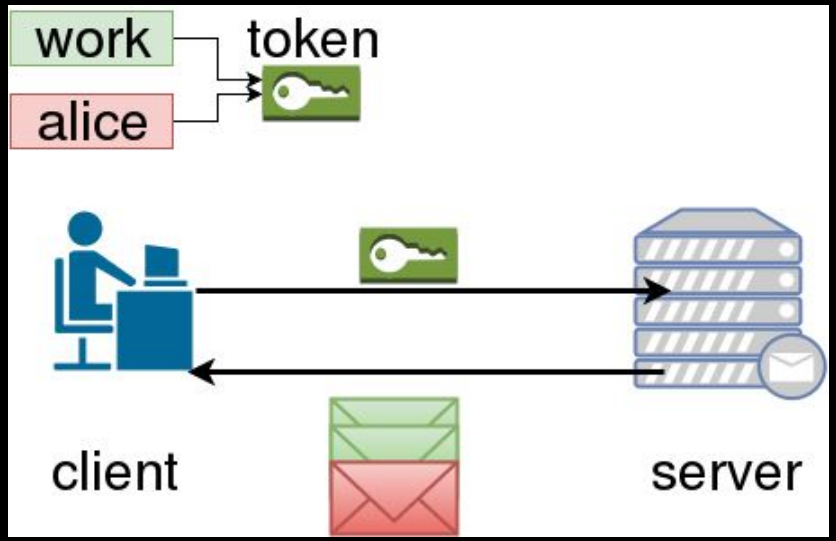
Searchable encryption

Introduction

Outsourced the storage of data to another party in a private manner

Ability to search over it

Delegated search



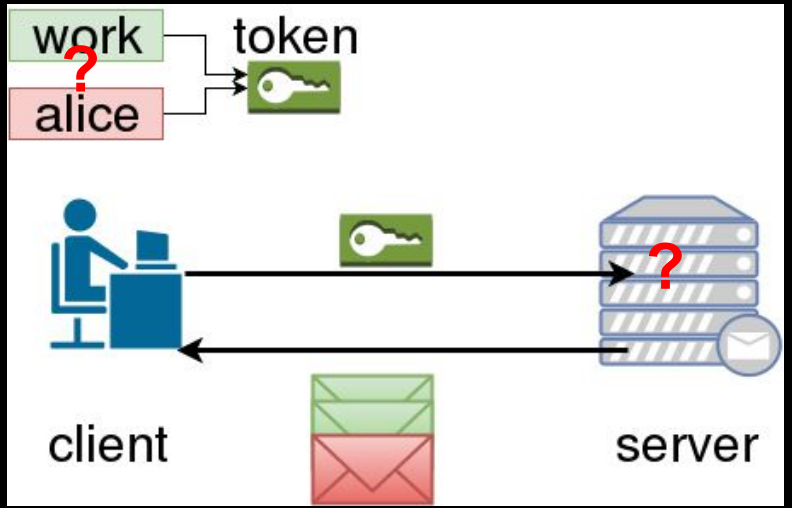
Searchable encryption

Properties and why it works

The entire database is encrypted --> Privacy will be ensured

Data owner generates tokens for search queries --> Search will not be abused

Searching will only leak limited information --> Privacy will be further protected



Implementation : Tools

Searchable encryption protocol : `Oblivious cross-tag encryption(OXT).`

Language : `Python3.6`

File processing: `Natural Language Toolkit`

Cryptographic tools : `Cryptography`

Connection between server and client : `TCP socket`

Implementation : Tools

Oblivious cross-tag encryption (OXT)

Advantage : First sublinear conjunctive-search solution

Approach : Apply search based on term frequency into encryption setting

Implementation : Tools

Oblivious cross-tag encryption (OXT)

```
T_Set : Single keyword search(SKS)

            Client :  TsetGetTag

            Server:   TsetRetrieve

X_Set:  Collection of certificates for every pair (ind,w)
```

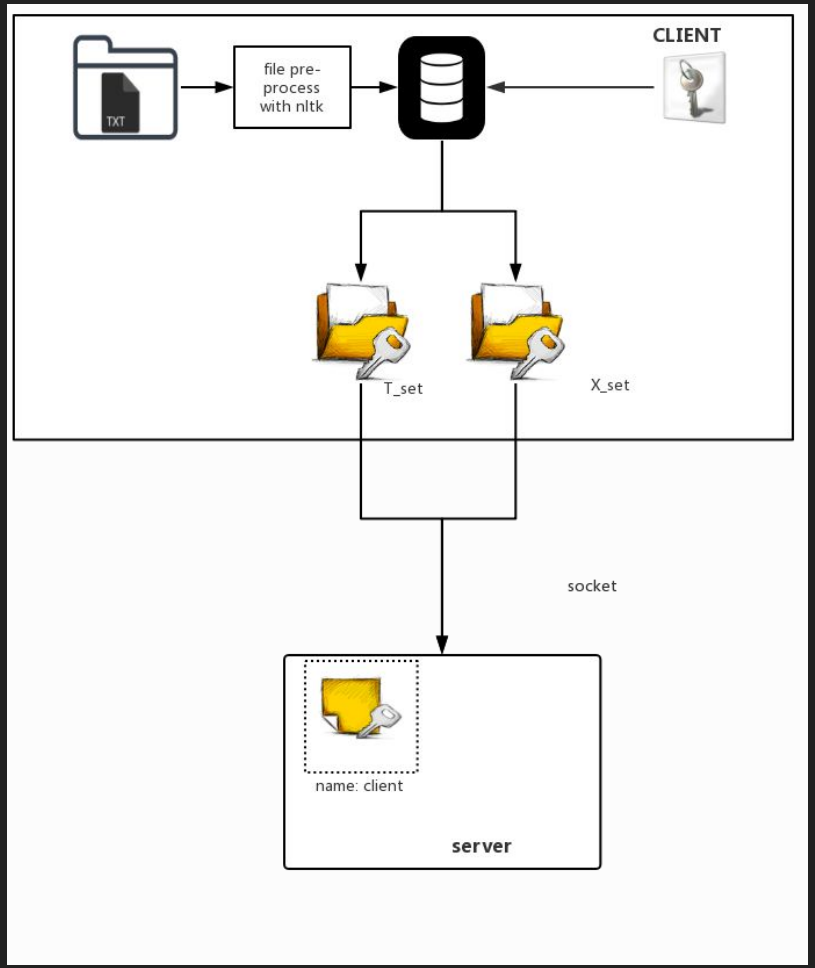
Workflow

Set up

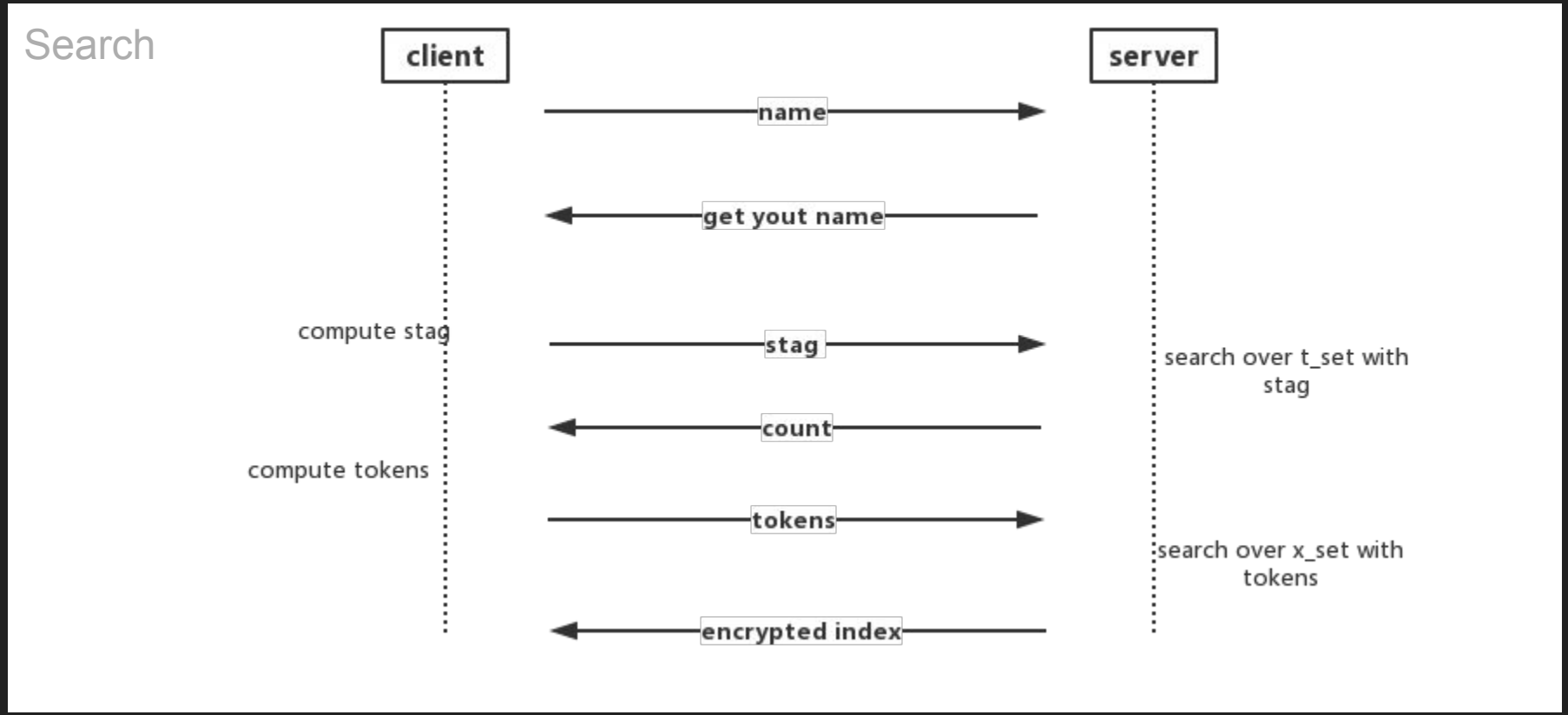
Client preprocesses files -->Database:$\{w, D_w\}$

Client encrypted database --> T_set file & X_set file

Client send T_set file & X_set file to server



Workflow


Search
client
server
name
get yout name
compute stag
stag
search over t_set with stag
count
compute tokens
tokens
search over x_set with tokens
encrypted index

Demo

Reference

Charlie Savage (JAN. 18, 2018) . *Congress Approves Six-Year Extension of Surveillance Law*

Charlie Savage (JAN. 18, 2018) . *House Extends Surveillance Law, Rejecting New Privacy Safeguards*

Gopal Ratnam (SEP. 11, 2017) . Congress Braces for Tense Debate on Surveillance Law

Tony Kontzer (JAN. 29, 2018) . *Congressional Votes on Controversial Surveillance Law Close Door on Privacy Debate—Or Do They?*

Henry Farrell (Apr. 24, 2018) . *Most lawyers don't understand cryptography. So why do they dominate tech policy debates?*

Paul Bernal (2016) Data gathering, surveillance and human rights: recasting the debate, Journal of Cyber Policy, 1:2,243-264, DOI: 10.1080/23738871.2016.1228990