A use case for DNSSEC

Phishing Protection

By Guido Witmond

http://eccentric-authentication.org

Phishing

- Phishing is the art of deception:
  - Humans are targeted;
  - The site you're on is not what you expect!
  - It looks like your bank, but it's a fake.

- Computers offer no protection.

  Our goal: Let the computer protect its user.

HTTPS / TLS / SSL

- We need HTTPS
  - It encrypts the connection against tampering;
  - It helps to identify the site;
  - And the green address bar gives confidence.
- We have a problem
  - Which CA to choose?

Choose a CA

- There are 160 of them
  - Each of those is good for a green bar;
  - Give 'em your money, get a certificate;
  - If one refuses, try another.
- Agony of choice isn't the problem
  - Any CA can sign any certificate for any site;
  - Criminals can get one for your bank;
  - With stolen credit cards and fake passports.

The CA problem

- Who is the CA of your bank?
  - How would you know?
  - How often do you check?
  - If the address bar is green, it's OK, isn't it?
- The core problem is this:
  - **Users won't know which is the <u>expected</u> CA for a given domain name.**

DNSSEC to the rescue

- Cue the music: DNSSEC to the rescue
- DANE: DNSSEC Authenticated Naming of Entities:
- **DANE specifies which is the expected CA for a given domain name.**
  - It solves a long standing problem:

    The missing link between domain name and Certificate;
- It opens doors to new possibilities

DANE usage

- Site creates a DANE / TLSA record:
  - TLSA specifies the TLS-Anchor,

    i.e. the CA that signs the server certificate;
  - It tells the user what to expect.
- Browser fetches the TLSA-record;
  - It verifies the DNSSEC-chain to ICANN Root;
  - It connects to the site;
  - And validates the actual server certificate against the record from the TLSA-record.

CA problem solved

- With DANE, the CA problem is solved
  - Almost for free: just publish the TLSA-record in your DNSSEC secured DNS-zone.
- Now you can choose a CA based on real criteria:
  - Their reputation; policies, support, etc.
- It protects users who opt in to check the TLSA-record and validate the DNSSEC chain.
- Others are out of luck. i.e. Diginotar'ed.

It's not enough against Phishing

- Scammers set up a DANE-protected fake site:
  - It looks just like your bank;
  - They lure you to it with a scary email;
  - To make you type your username and password.
- There lies the problem:

  Users managing their own passwords.

Let's do better

- Users could deploy a password manager:
  - It manages all accounts and passwords;
  - It does the sign-up, log-in and log-out;
  - It has buttons for these operations.
- The manager remembers which accounts a user has at each site.
- The user decides what to do, i.e. sign-up, log in, log out: the manager makes it happen.

Password manager does DNSSEC

- When the user presses the 'Log In'-button:
  - The manager validates the DNSSEC chain
  - It validates the server certificate against DANE
  - It shows which accounts it has for that site;
  - And lets the user choose one;
  - Only then it presents the password at the site.
- You don't have to remember your passwords;

  Nor type them in.
- Your agent does the work for you.

This makes phishing difficult

- Here's how:
  - While scammers can copy the looks of a site;
  - They can't fake the domain name;
  - They have to use there own domain name;
  - To the password manager, that is a new site:
    - It helpfully offers to create a new account and password.
- This should wake people up.
  - “Where is my password for the bank?”
  - “It was here yesterday.”

A really scared user ...

- Suppose, our user is really scared and doesn't take 'No' from the manager; they'll do anything:
  - Open the manager to get the password;
  - And happily give it to the ~~bank~~ scammers.
- Password Manager should not allow that
  - It should never reveal passwords to its user;
  - Best to deploy a cryptographic zero-knowledge proof.

Almost there

- Users have multiple devices;
  - The password manager could use synchronising;
- Use a master password / facial scan / fingerprint to protect the password store.

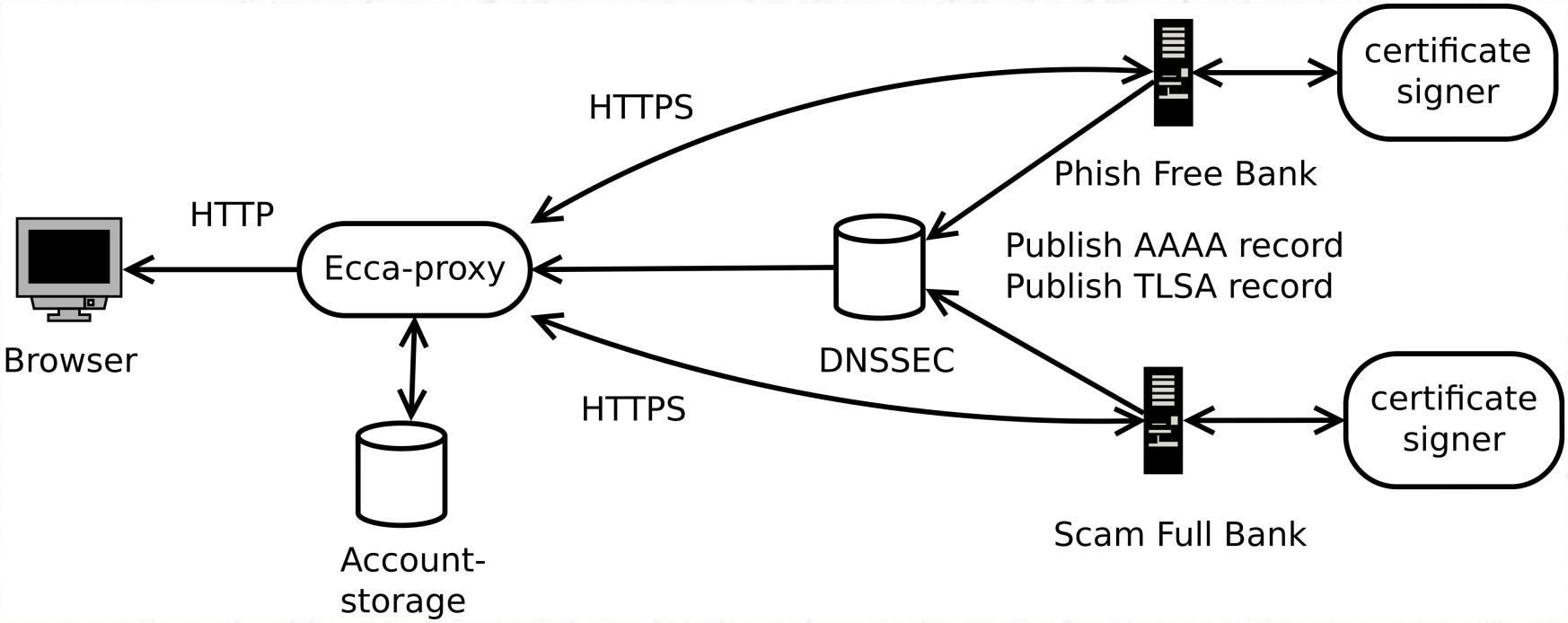
- Malware is still a threat:
  - Use malware-resistant OS (Qubes, Genode, Minix)

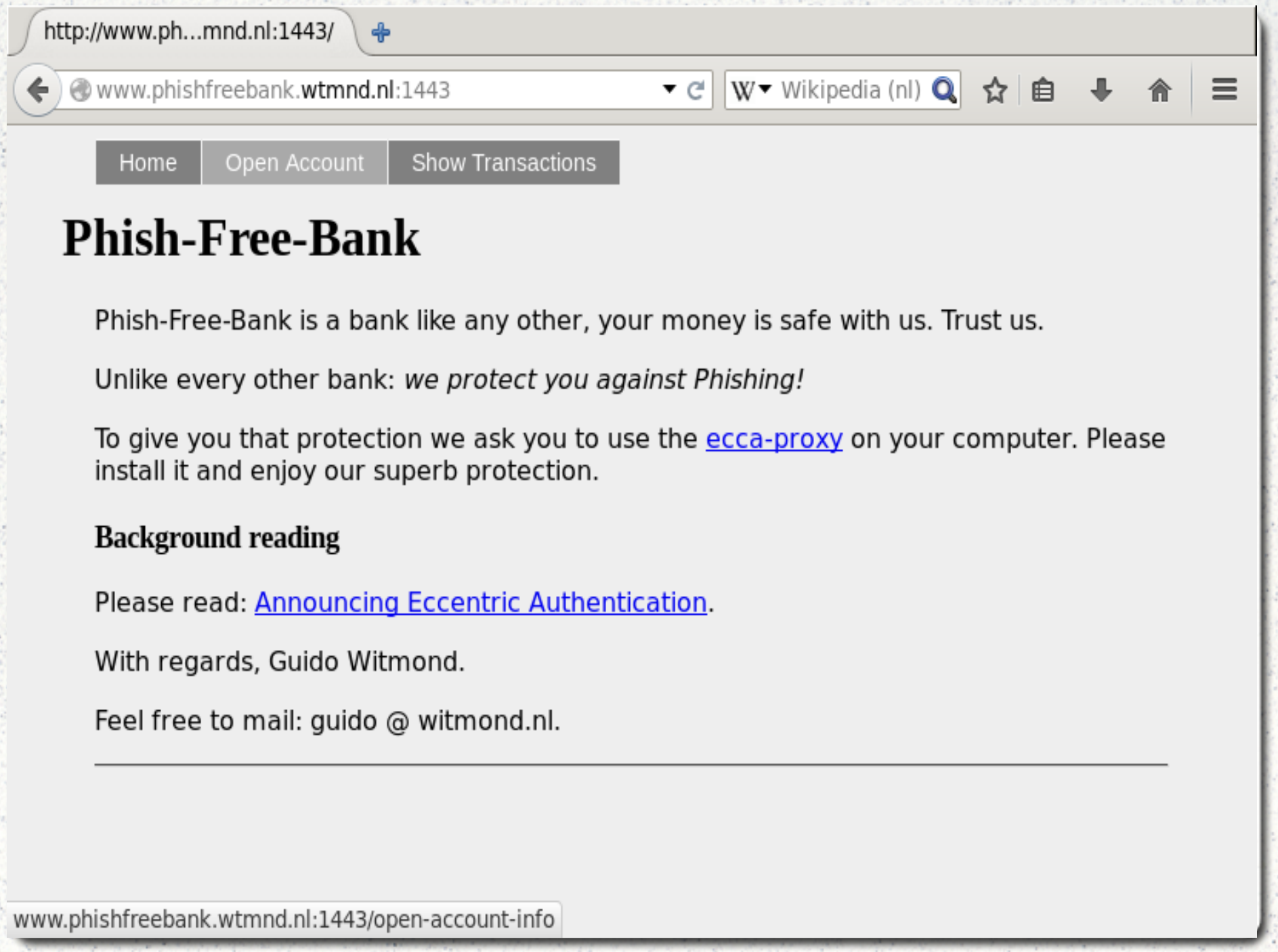
    We need these!

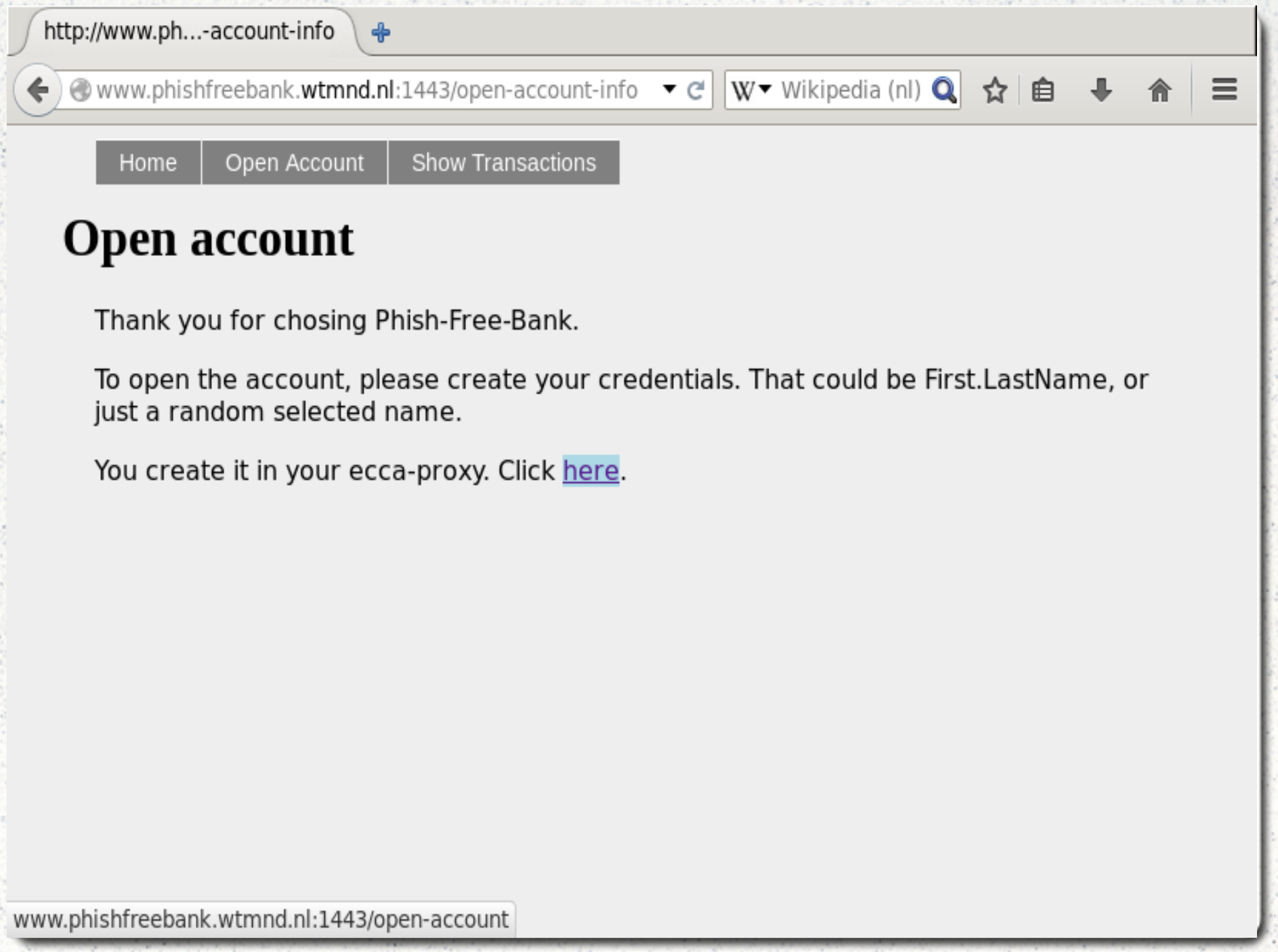
Demo

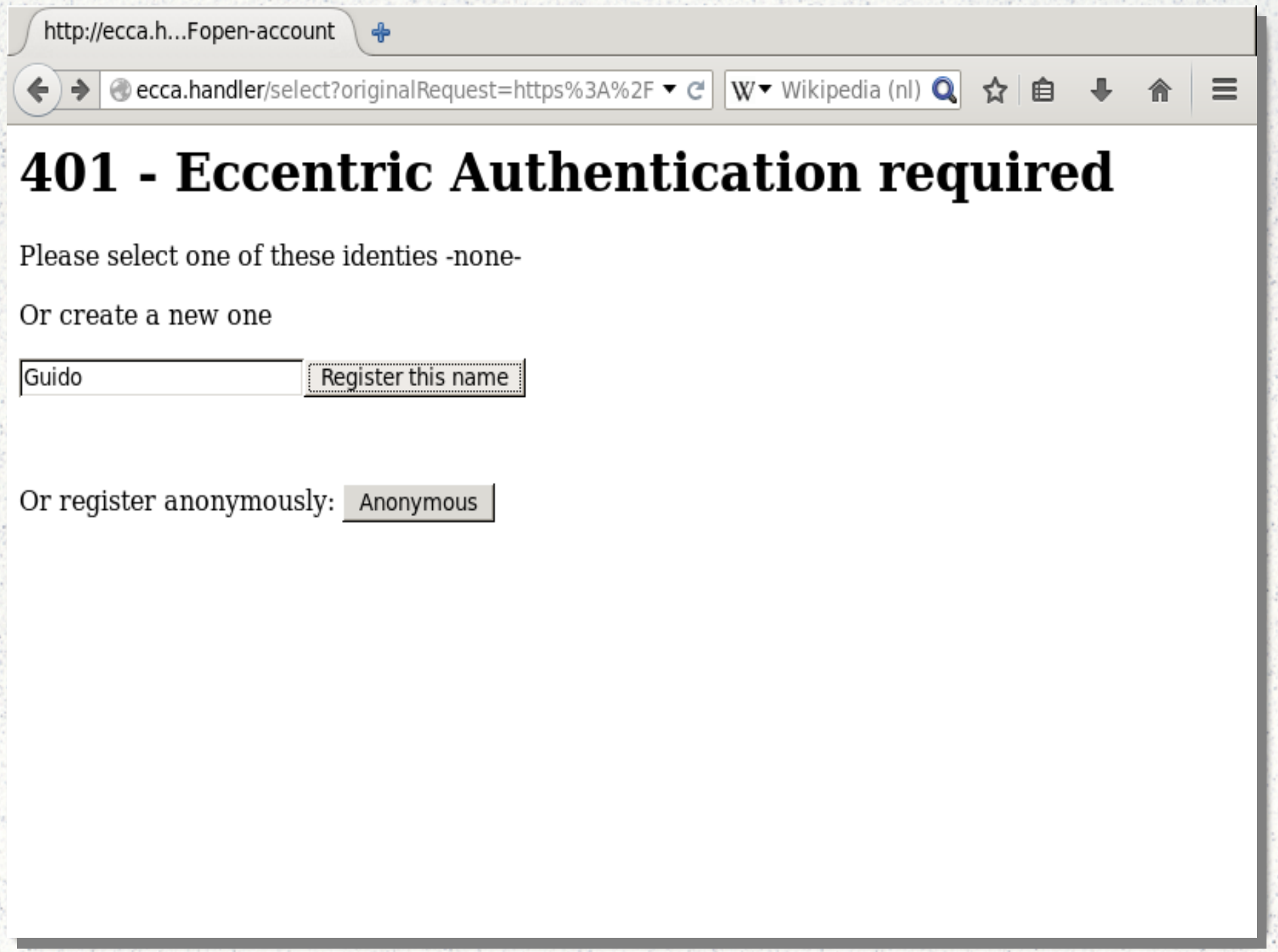
- Using client certificates instead of passwords
  - It's a zero knowledge proof;
  - Webservers already know how to deal with it;
  - It's easier to program too.
- We have a user agent to request certificates;
  - And a server side component to sign these.
- Each site signs their own client certificates;
  - And only accepts their own.

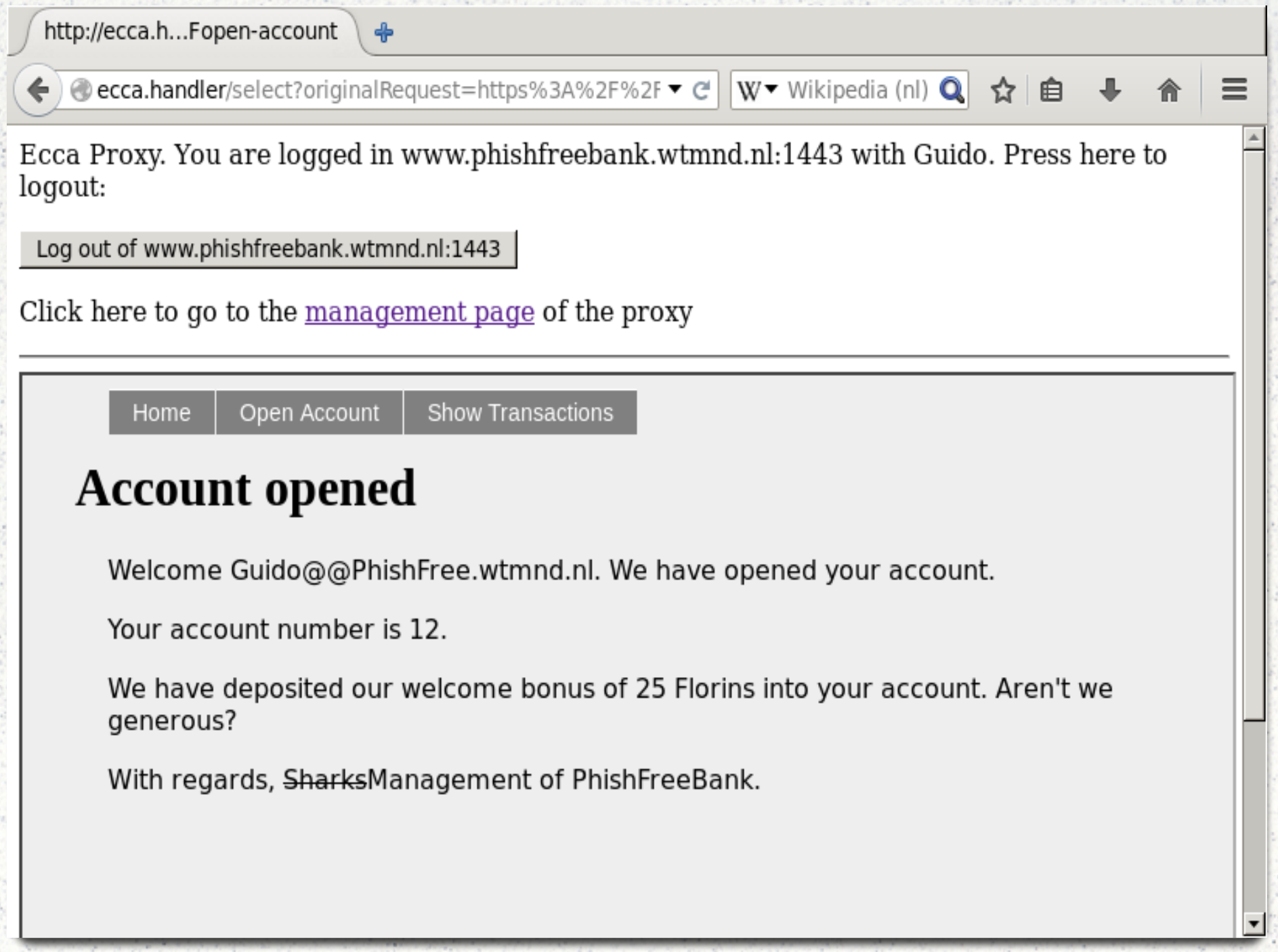
Demo network

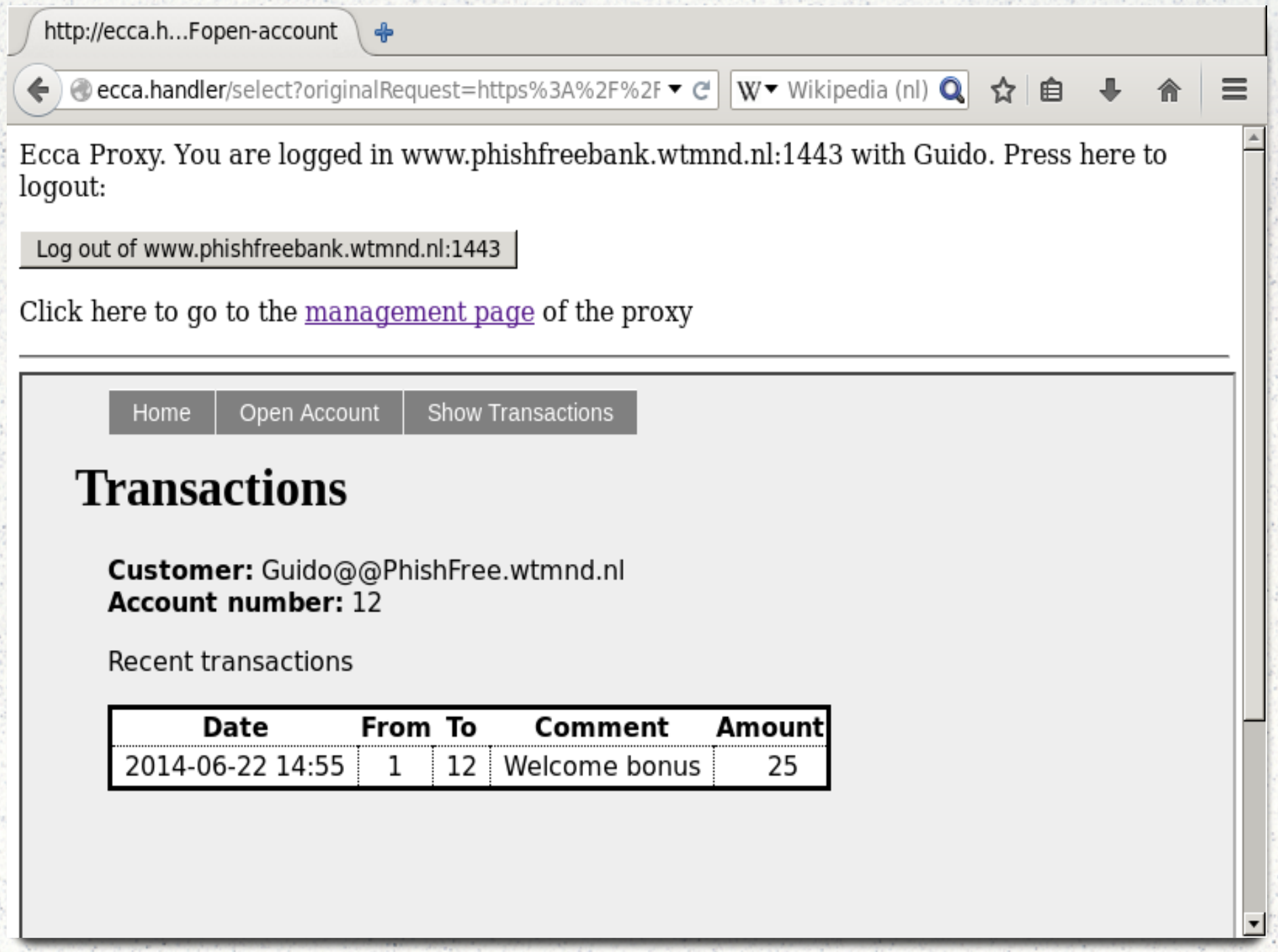


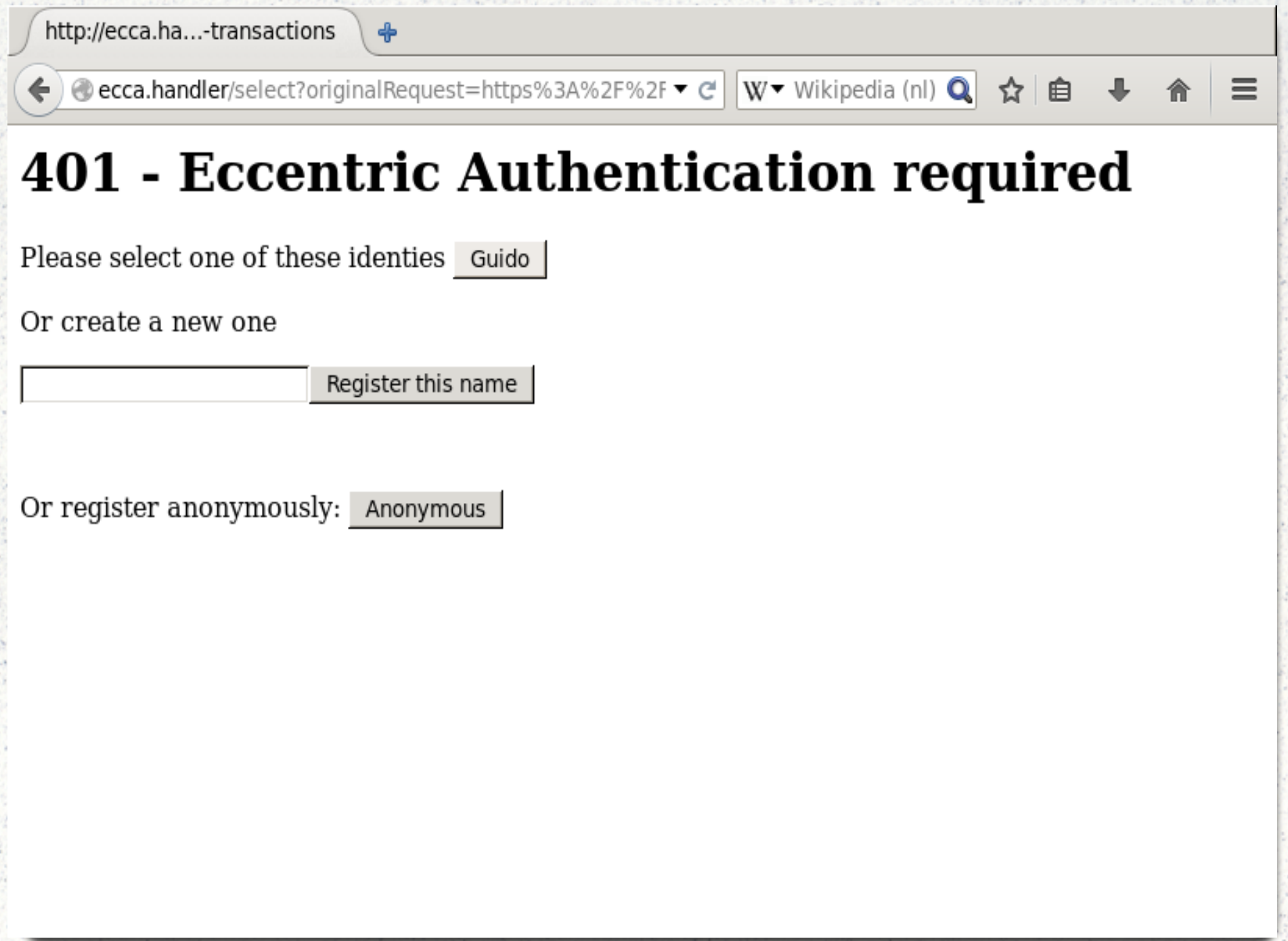

http://www.ph...mnd.nl:1443/
www.phishfreebank.wtmnd.nl:1443
Wikipedia (nl)
Home
Open Account
Show Transactions
Phish-Free-Bank
Phish-Free-Bank is a bank like any other, your money is safe with us. Trust us.
Unlike every other bank: we protect you against Phishing!
To give you that protection we ask you to use the ecca-proxy on your computer. Please install it and enjoy our superb protection.
Background reading
Please read: Announcing Eccentric Authentication.
With regards, Guido Witmond.
Feel free to mail: guido @ witmond.nl.
www.phishfreebank.wtmnd.nl:1443/open-account-info

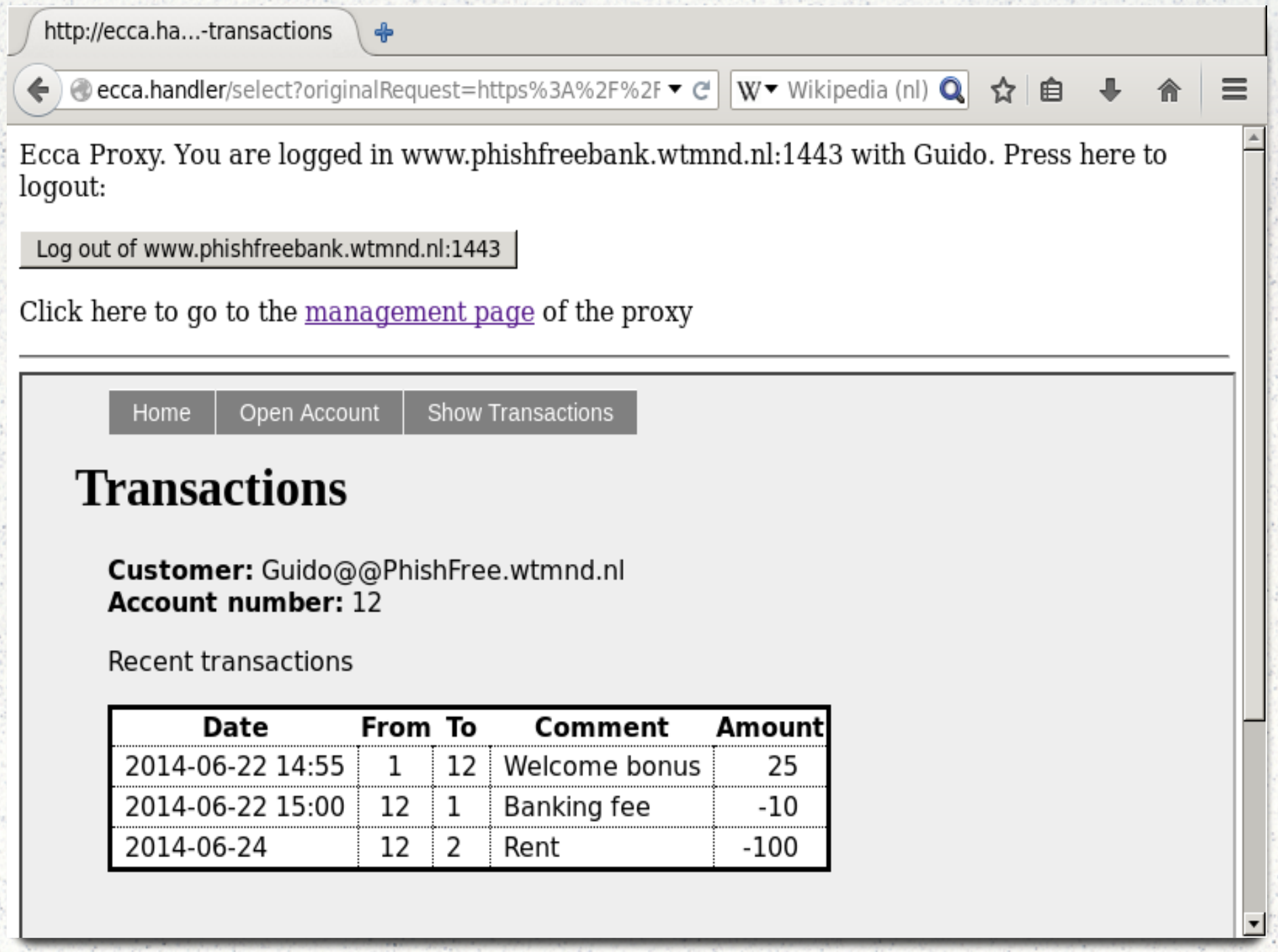

http://www.ph...-account-info
www.phishfreebank.wtmnd.nl:1443/open-account-info
Wikipedia (nl)
Home
Open Account
Show Transactions
Open account
Thank you for chosing Phish-Free-Bank.
To open the account, please create your credentials. That could be First.LastName, or just a random selected name.
You create it in your ecca-proxy. Click here.
www.phishfreebank.wtmnd.nl:1443/open-account


http://ecca.h...Fopen-account
ecca.handler/select?originalRequest=https%3A%2F
Wikipedia (nl)
401 - Eccentric Authentication required
Please select one of these identies -none-
Or create a new one
Guido
Register this name
Or register anonymously:
Anonymous


http://ecca.h...Fopen-account
ecca.handler/select?originalRequest=https%3A%2F%2F
Wikipedia (nl)
Ecca Proxy. You are logged in www.phishfreebank.wtmnd.nl:1443 with Guido. Press here to logout:
Log out of www.phishfreebank.wtmnd.nl:1443
Click here to go to the management page of the proxy
Home
Open Account
Show Transactions
Account opened
Welcome Guido@@PhishFree.wtmnd.nl. We have opened your account.
Your account number is 12.
We have deposited our welcome bonus of 25 Florins into your account. Aren't we generous?
With regards, SharksManagement of PhishFreeBank.


http://ecca.h...Fopen-account
ecca.handler/select?originalRequest=https%3A%2F%2F
Wikipedia (nl)
Ecca Proxy. You are logged in www.phishfreebank.wtmnd.nl:1443 with Guido. Press here to logout:
Log out of www.phishfreebank.wtmnd.nl:1443
Click here to go to the management page of the proxy
Home
Open Account
Show Transactions
Transactions
Customer: Guido@@PhishFree.wtmnd.nl
Account number: 12
Recent transactions
Date
From
To
Comment
Amount
2014-06-22 14:55
1
12
Welcome bonus
25


http://ecca.ha...-transactions
ecca.handler/select?originalRequest=https%3A%2F%2F
Wikipedia (nl)
401 - Eccentric Authentication required
Please select one of these identies
Guido
Or create a new one
Register this name
Or register anonymously:
Anonymous

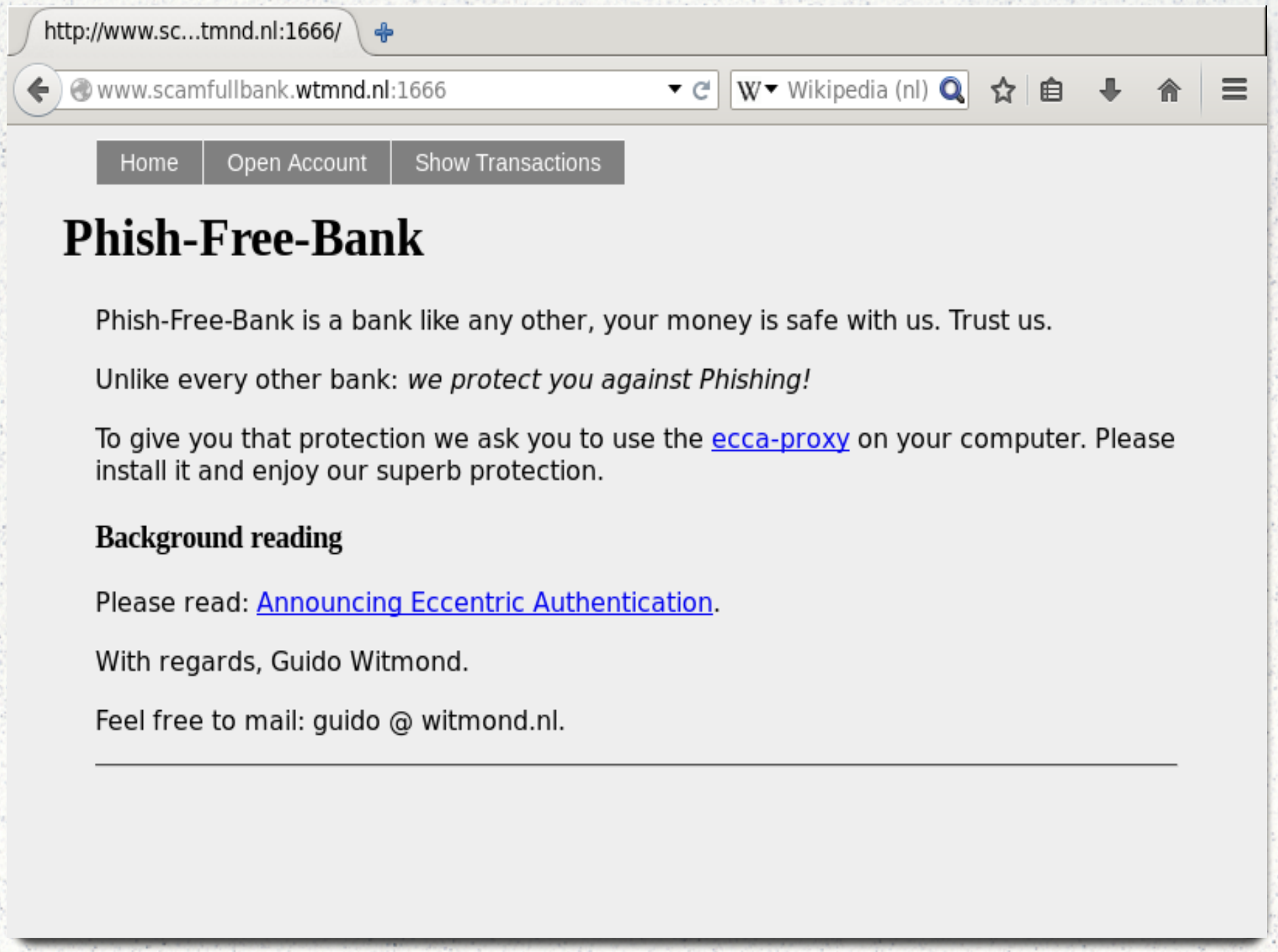

http://ecca.ha...-transactions
ecca.handler/select?originalRequest=https%3A%2F%2F
Wikipedia (nl)
Ecca Proxy. You are logged in www.phishfreebank.wtmnd.nl:1443 with Guido. Press here to logout:
Log out of www.phishfreebank.wtmnd.nl:1443
Click here to go to the management page of the proxy
Home
Open Account
Show Transactions
Transactions
Customer: Guido@@PhishFree.wtmnd.nl
Account number: 12
Recent transactions
Date From To Comment Amount
2014-06-22 14:55 1 12 Welcome bonus 25
2014-06-22 15:00 12 1 Banking fee -10
2014-06-24 12 2 Rent -100

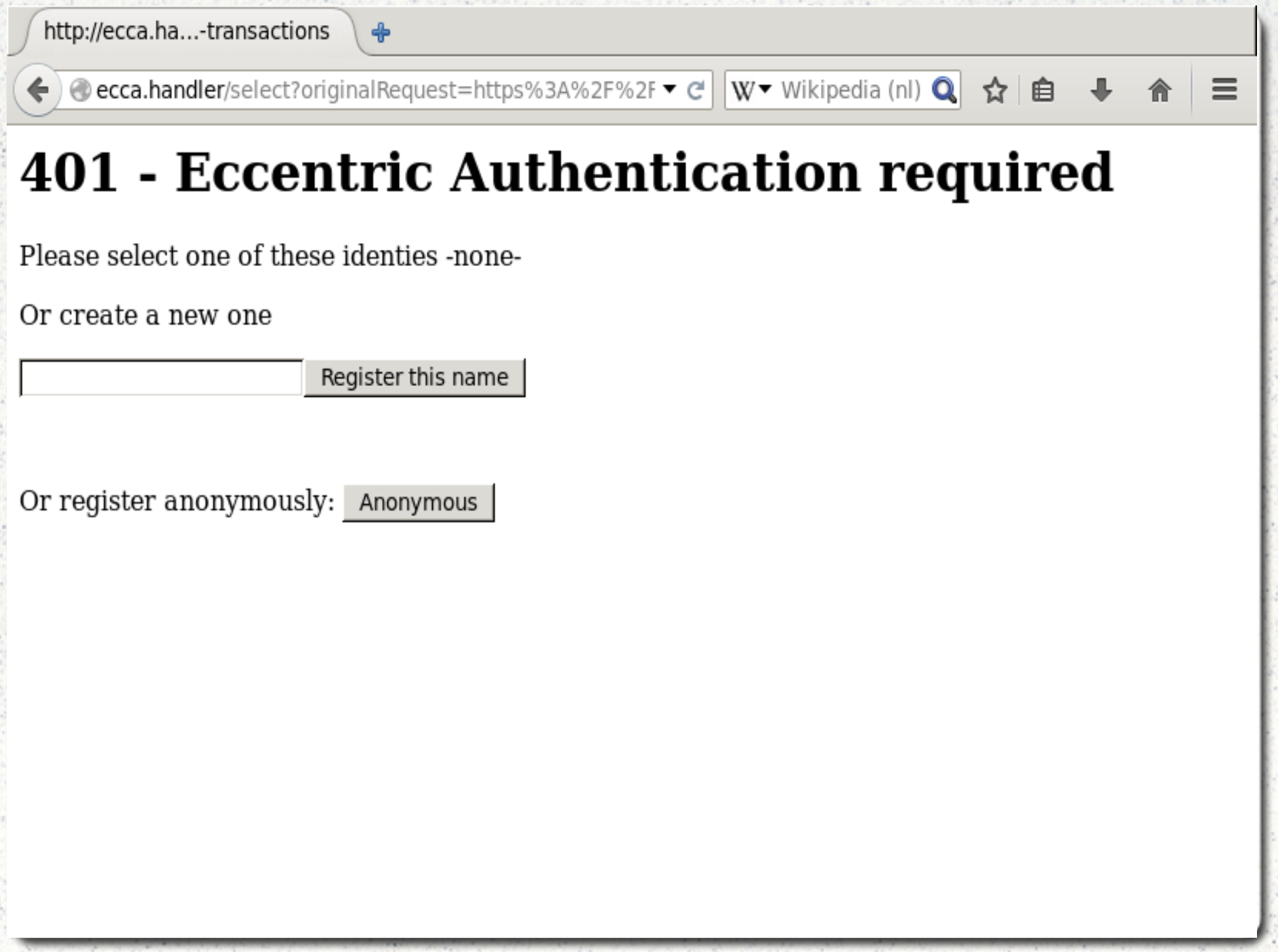
The fatal email

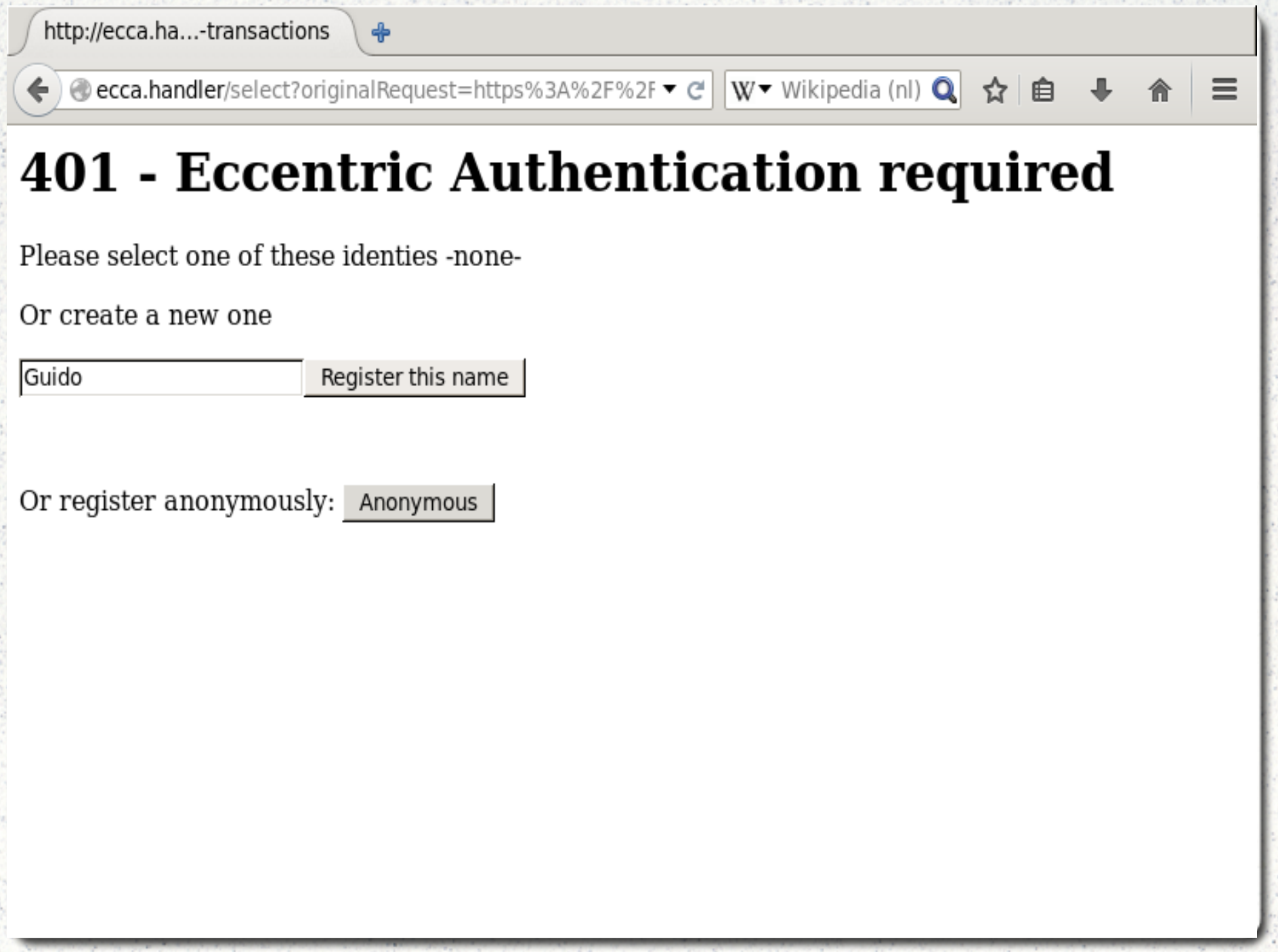
- From: customer-support@phishfreebank

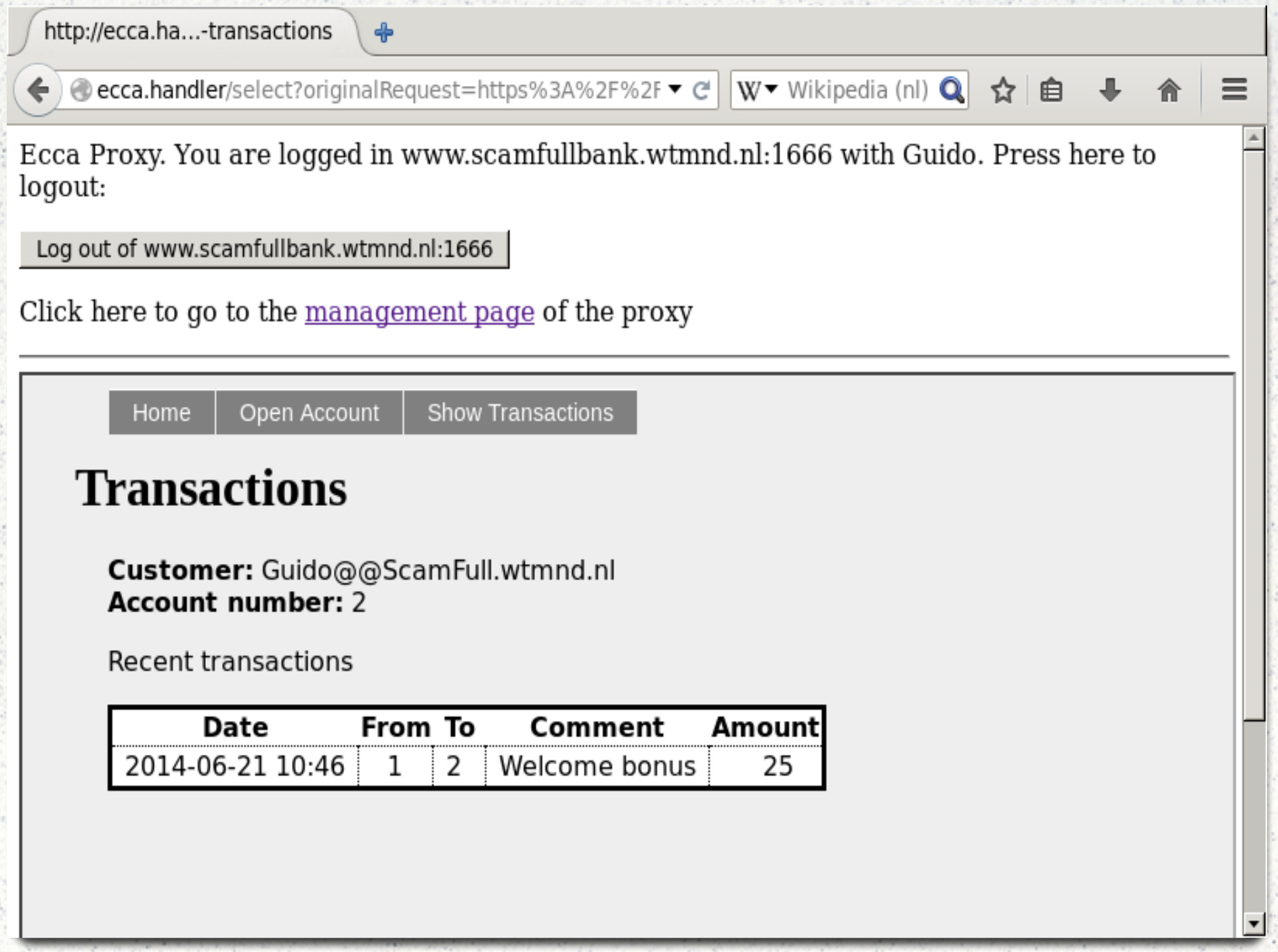
  Dear Customer,

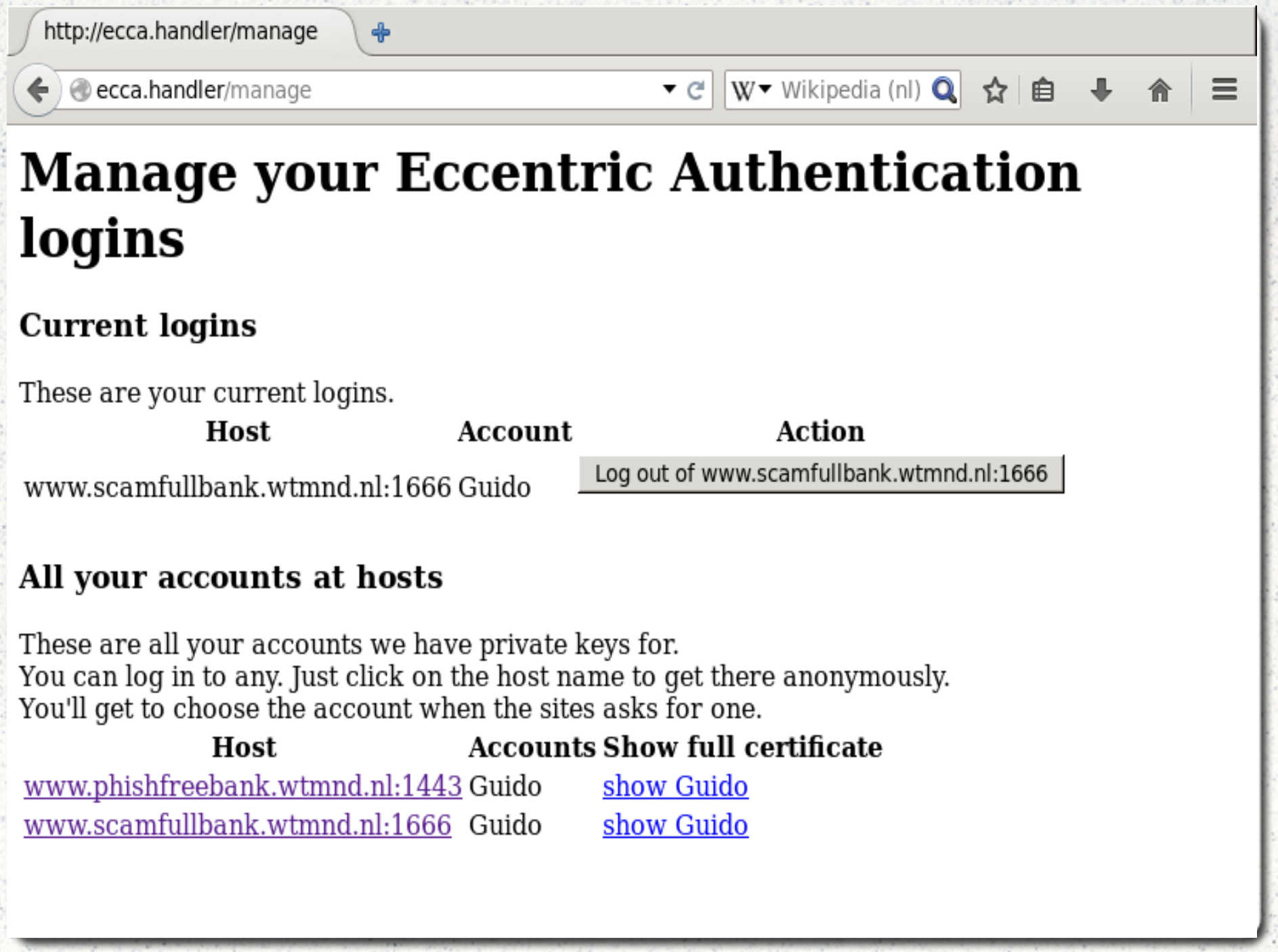
  - We have a transaction waiting, please log in to allow or prevent the 1.500,- florins from being deducted.
  - Click here: phishfreebank (scamfullbank.wtmnd.nl)


http://www.sc...tmnd.nl:1666/
www.scamfullbank.wtmnd.nl:1666
Wikipedia (nl)
Home
Open Account
Show Transactions
Phish-Free-Bank
Phish-Free-Bank is a bank like any other, your money is safe with us. Trust us.
Unlike every other bank: we protect you against Phishing!
To give you that protection we ask you to use the ecca-proxy on your computer. Please install it and enjoy our superb protection.
Background reading
Please read: Announcing Eccentric Authentication.
With regards, Guido Witmond.
Feel free to mail: guido @ witmond.nl.


http://ecca.ha...-transactions
ecca.handler/select?originalRequest=https%3A%2F%2F
Wikipedia (nl)
401 - Eccentric Authentication required
Please select one of these identies -none-
Or create a new one
Register this name
Or register anonymously:
Anonymous


http://ecca.ha...-transactions
ecca.handler/select?originalRequest=https%3A%2F%2F
Wikipedia (nl)
401 - Eccentric Authentication required
Please select one of these identies -none-
Or create a new one
Guido
Register this name
Or register anonymously:
Anonymous


http://ecca.ha...-transactions
ecca.handler/select?originalRequest=https%3A%2F%2F
Wikipedia (nl)
Ecca Proxy. You are logged in www.scamfullbank.wtmnd.nl:1666 with Guido. Press here to logout:
Log out of www.scamfullbank.wtmnd.nl:1666
Click here to go to the management page of the proxy
Home
Open Account
Show Transactions
Transactions
Customer: Guido@@ScamFull.wtmnd.nl
Account number: 2
Recent transactions
Date
From
To
Comment
Amount
2014-06-21 10:46
1
2
Welcome bonus
25


http://ecca.handler/manage
ecca.handler/manage
Wikipedia (nl)
Manage your Eccentric Authentication logins
Current logins
These are your current logins.
Host
Account
Action
www.scamfullbank.wtmnd.nl:1666
Guido
Log out of www.scamfullbank.wtmnd.nl:1666
All your accounts at hosts
These are all your accounts we have private keys for.
You can log in to any. Just click on the host name to get there anonymously.
You'll get to choose the account when the sites asks for one.
Host
Accounts
Show full certificate
www.phishfreebank.wtmnd.nl:1443
Guido
show Guido
www.scamfullbank.wtmnd.nl:1666
Guido
show Guido

Conclusion

- DNSSEC is good!
- It paved the way for DANE;
  - Together, these form a killer app.
- With a different way of account management,
  - Get rid of remote passwords;
  - Let the computer manage accounts:
- Phishing can be reduced tremendously
  - The computer distinguishes friend from foe.

Questions

- Questions …?