



Blinkenwalls, Electronic Windows, and other "magical" portals with Tox

<https://github.com/Zoxcore/ToxBlinkenwall>

zoff, strfry at Easterhegg 2019 20.04.2019



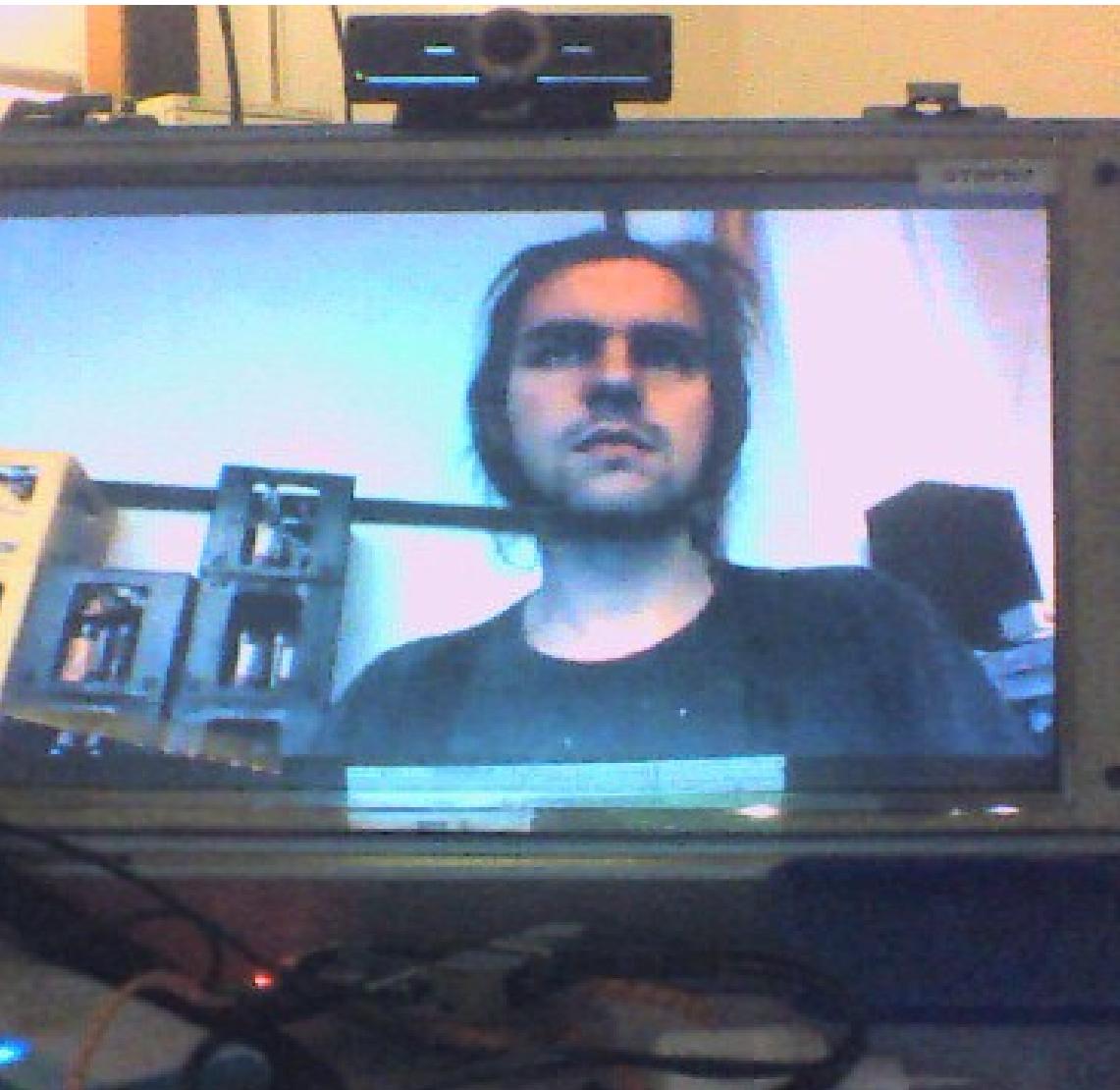
About

Zoff

- Eletrotechnik
- IT Worker
- System Administrator
(Linux, Solaris)
- Projectmanager



About



@strfry

Software Engineer,
Hardware Hacker and
Raspberry Pi Enthusiast

Built Experience from Linux
Game Development



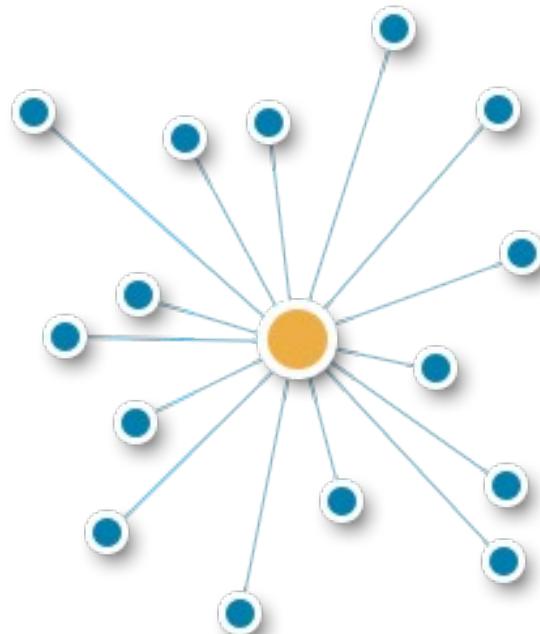
Some basics

Let's start with some basics

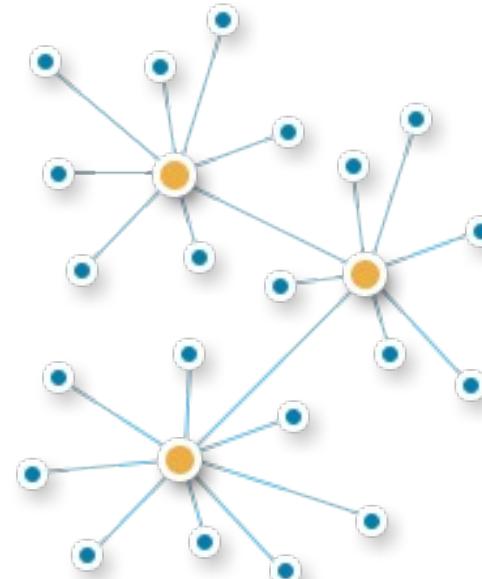


different types of networks

Centralized



Decentralized



Federated - Matrix

most users are on 1 central server

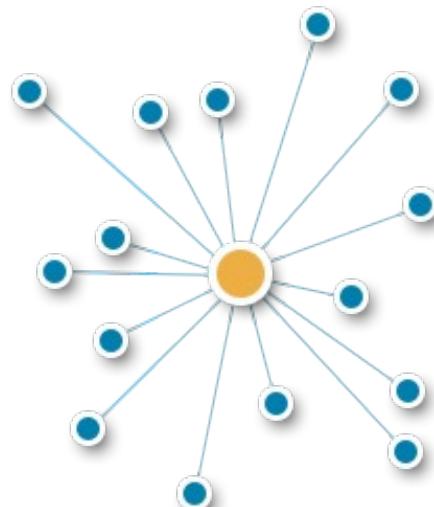
source:

https://www.hello-matrix.net/public_servers.php

Public Aliases shows the number of published aliases in that homeserver's public room directory and is based on the `total_room_count_estimate` returned by the servers' APIs. We update this number once a day.

Centralized

* October 2018

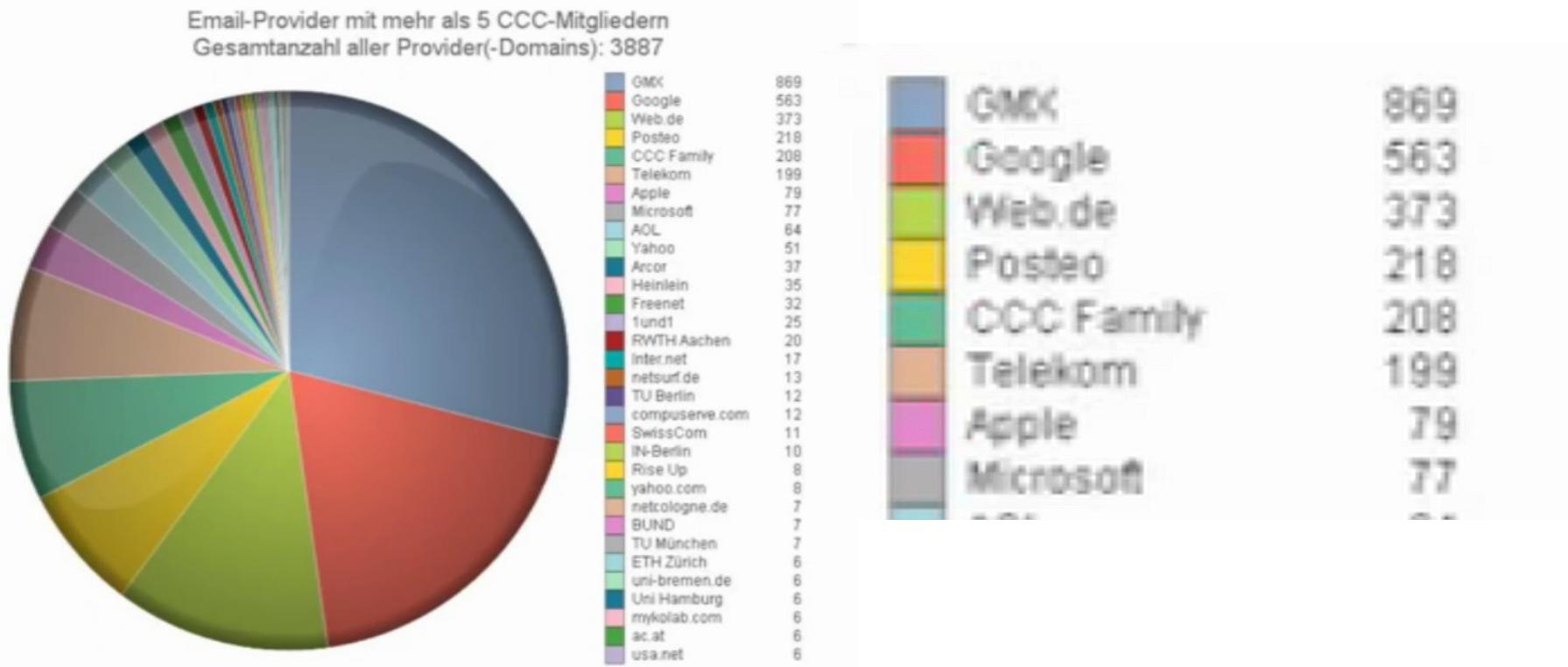


Office CCC - EMail providers

most users are on a few providers

source:

https://media.ccc.de/v/eh16-68-how_to_ccc_office



Can we do better?

Can we do some things better?

with less effort, less dependencies?



Tox?



A New Kind of Instant Messaging

Whether it's corporations or governments, digital surveillance today is widespread. Tox is easy-to-use software that connects you with friends and family without anyone else listening in. While other big-name services require you to pay for features, Tox is completely free and comes without advertising — forever.

 Download

 Learn more



What is Tox?

Tox began in the wake of Edward Snowden's leaks regarding NSA spying activity.

The idea was to create an instant messaging application that ran without requiring the use of central servers, with no way to disable any of the encryption features.

The application would be easily usable by the layperson with no practical knowledge of cryptography or distributed systems.

During the Summer of 2013 a small group of developers from all around the globe formed and began working on a library implementing the Tox protocol.



Encrypted

Everything you do with Tox is encrypted using open-source libraries. The only people who can see your conversations are the people you're talking with.



Distributed

Tox has no central servers that can be raided, shut down, or forced to turn over data — the network is made up of its users. Say goodbye to server outages!



Free

Tox is free software. That's [free as in freedom](#), as well as in price. This means Tox is yours — to use, modify, and share — because Tox is developed by and for the users.



Toxcore - Features

- Distributed (No Central Servers)
- End-to-end encryption (always, everything)
- No Registration (no Email, no Phonenumber)
- No Username
- No Setup
- No Hostname
- works over any Port
- UDP and **TCP** supported (even **for A/V Calls**)
- Proxy support (e.g. **Tor**, even **for A/V Calls**)
- Password protect your Private-Key



* as of October 2018 11

Basic features of Tox?



Instant messaging

Chat instantly across the globe with Tox's secure messages.



Voice

Keep in touch with friends and family using Tox's completely free and encrypted voice calls.



Video

Catch up face to face, over Tox's secure video calls.



Screen sharing

Share your desktop with your friends with Tox's screen sharing.



File sharing

Trade files, with no artificial limits or caps.



Groups

Chat, call, and share video and files with the whole gang in Tox's group chats.



Tox in your language ...

Language bindings

- Bash
- C#
- Go go-tox
- Go go-toxcore
- Go gtox
- Haskell
- Java
- Java/Scala
- JavaScript
- Node.js (Node.js addon)
- Julia (Attempt to make Toxcore accessible in Julia)
- Objective C objcTox
- Objective C ToxController
- Pascal
- Python
- Racket
- Ruby
- Rust tox-rs
- Rust rstox
- Vala



Fun things with Tox ...

some very fun things to check out:

- VPN over Tox

<https://github.com/cleverca22/toxvpn>

<https://github.com/gjedeer/tuntox/blob/master/VPN.md>

- SSH over Tox

<https://github.com/gjedeer/tuntox>

- VNC over Tox

<https://github.com/gjedeer/tuntox>



Source and compiling

A Look at the source code and dependencies for compiling.

Can Video chat be done without WebRTC?

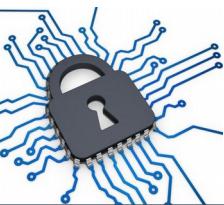
Can we reduce the dependencies to a minimum?



Toxcore - Source Stats

• toxcore	files: 61	C: 25	SLOC: 21.333
• toxav	files: 38	C: 16	SLOC: 8.512
• toxencryptsave	files: 24	C: 8	SLOC: 1.696
• toxutil	files: 4	C: 1	SLOC: 1.005
• Total	files: 127	C: 50	SLOC: 32.546*

* measured October 2018



libjingle_peerconnection

- **Total** C++: 446 SLOC: 164.358*
- cmp. c-toxcore ~ x9 ~ x5

* measured October 2018

Languages

Language	Lines
cpp	158676 (96.54%)
ansic	5244 (3.19%)
python	438 (0.27%)

Totals

Total Physical Lines of Code (SLOC): 164,358

Estimated development effort: 38.65 (463.75) person-years (person-months)

Schedule estimate: 1.44 (17.22) years (months)

Total estimated cost to develop: \$ 5,220,534

Please credit this data as "generated using 'SLOCCount' by David A. Wheeler."



Web-RTC

- **Total**
- **cmp. c-toxcore**

C++: 2150
~ x43

SLOC: 664.070*
~ x20

Language	Lines
cpp	559367 (84.23%)
ansic	49022 (7.38%)
java	29225 (4.40%)
python	12120 (1.83%)
objc	9241 (1.39%)
sh	1980 (0.30%)
javascript	1618 (0.24%)
xml	1142 (0.17%)
asm	355 (0.05%)

* measured October 2018

Totals

Total Physical Lines of Code (SLOC): 664,070

Estimated development effort: 165.69 (1,988.25) person-years (person-months)

Schedule estimate: 2.80 (33.55) years (months)

Total estimated cost to develop: \$ 22,382,128

Please credit this data as "generated using 'SLOCCount' by David A. Wheeler."



Toxcore - Dependencies

- toxcore + toxencryptsave

- libsodium

<https://github.com/jedisct1/libsodium>

Libsodium v1.0.12 and v1.0.13 Security Assessment in 2017

<https://www.privateinternetaccess.com/blog/2017/08/libsodium-v1-0-12-and-v1-0-13-security-assessment/>



- toxav

- libvpx <https://github.com/webmproject/libvpx>
 - libopus <https://github.com/xiph/opus>

- x264* <https://git.videolan.org/?p=x264.git;a=shortlog;h=refs/heads/stable>
 - libav* <https://github.com/libav/libav>

* c-toxcore Research branch (experimental H.264 support and other upgrades)
<https://github.com/Zoxcore/c-toxcore>



Toxcore - Dependencies (2)

- libvpx <https://github.com/webmproject/libvpx>
- libopus <https://github.com/xiph/opus>
 - yasm <https://github.com/yasm/yasm>
- x264* <https://git.videolan.org/?p=x264.git;a=shortlog;h=refs/heads/stable>
- libav* <https://github.com/libav/libav>
 - nasm <https://www.nasm.us/pub/nasm/releasebuilds/2.13.02/nasm-2.13.02.tar.bz2>
 - yasm <https://github.com/yasm/yasm>



* c-toxcore Research branch (experimental H.264 support and other upgrades)
<https://github.com/Zoxcore/c-toxcore>

Toxcore - Platform Support

- Windows (32bit?, 64bit) H.264 HW Acceleration*
- Linux (Debian, Ubuntu, Suse, Alpine, ...) H.264 HW Acceleration*
- BSD (open BSD, free BSD)
- OSX
- IOS (IPhone)
- ARM (Android, Raspberry PI) H.264 HW Acceleration*
- Solaris (open Solaris)

* c-toxcore Research branch

<https://github.com/Zoxcore/c-toxcore>

* as of October 2018



Toxcore - Features

What Tox does not:

- Does NOT guarantee to hide your IP address
→ (use Tor as Proxy)
- NO offline Messages (yet)
→ (some proposals discussed)
- NO Multidevice support (yet)
→ (early beta testing, tweaking specification)



* as of October 2018

Want to get involved?

for more information about Tox please visit these links:

<https://tox.chat/faq.html>



<https://toktok.ltd/integrations.html>



We need your help

We are looking for help with these:

- Graphics design (icons, flyer, logos ...)
- C Development (c-toxcore, toxblinkenwall)
- Case design (3D printed case, buttons, input devices ...)
- RaspberryPI Images (Custom Raspian, Alpine ...)

talk to us on Matrix:

https://matrix.to/#/#freenode_#ewindow:matrix.org



my first Tox client

Echobot, just 100 lines of C code

(https://wiki.tox.chat/developers/client_examples/echo_bot)

```
#include <sys/types.h>
#include <sys/socket.h>
#include <unistd.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <string.h>
#include <unistd.h>

#include <sodium/include.h>
#include <tox/tox.h>

typedef struct DHT_node {
    const char *pub_key;
    const char *hex_TOX_PUBLIC_KEY;
    const uint8_t *public_key;
    const uint8_t *message;
    size_t length;
} DHT_node;

void friend_request_cbTox *tox, const uint8_t *public_key, const uint8_t *message, size_t length,
                           void *user_data)
{
    tox_friend_add_norequest(tox, public_key, NULL);
}

void friend_message_cbTox *tox, uint32_t friend_number, TOX_MESSAGE_TYPE type, const uint8_t *message,
                           size_t length, void *user_data)
{
    tox_friend_send_message(tox, friend_number, type, message, length, NULL);
}

void self_connection_status_cbTox *tox, TOX_CONNECTION connection_status, void *user_data)
{
    switch(connection_status) {
        case TOX_CONNECTION_NONE:
            printf("Offline\n");
            break;
        case TOX_CONNECTION_TCP:
            printf("Online, using TCP\n");
            break;
        case TOX_CONNECTION_UDP:
            printf("Online, using UDP\n");
            break;
    }
}

int main()
{
    Tox *tox = tox_new(NULL, NULL);

    const char *name = "Echobot";
    tox_set_name(tox, name, strlen(name), NULL);

    const char *status_message = "Echoing your messages";
    tox_set_status_message(tox, status_message, strlen(status_message), NULL);

    DH_node nodes[] = {
        {"1.1.1.1:2000", 33445, "7B92C0D0A4F7BD1B5B16C2F0A5BEBD0253C64CC1C6314359E27704D93FB6B", {0}},
        {"2nd.chatbot.chat:161", 33445, "7B92C0D0A4F7BD1B5B16C2F0A5BEBD0253C64CC1C6314359E27704D93FB6B", {0}},
        {"tx.zoducks.org", 33445, "A09162D88618E742FFBCA1C2C70383E6679604D2D90EAE3A4D0995A1AC8A074", {0}},
        {"163.172.136.118", 33445, "2C28BF9F37C20D90DA35E655B8F496FA8736483F3A8141817A72E3F18ACAB", {0}},
        {"240.119.199.197", 33445, "B05C8869D9B4E0D0308F43C1A974A20A725A39EACCA123862FDE9945BF9D3E99", {0}},
        {"240.61.90.6:17ca0a01", 33445, "B05C8869D9B4E0D0308F43C1A974A20A725A39EACCA123862FDE9945BF9D3E99", {0}},
        {"node.tox.harbri.org", 33445, "F040ABA0A1C99A9D97D61A6B5489B56793E1DEF8BD46B1036B9082ZEB8460FAB67", {0}}
    };

    for(size_t i = 0; i < sizeof(nodes)/sizeof(DH_node); i++) {
        sodium_hex2bin(nodes[i].key_hex, sizeof(nodes[i].key_hex));
        nodes[i].key_bin = nodes[i].key_hex;
        nodes[i].key_hex = NULL;
        NULL, NULL, NULL);
    }

    tox_id_hex[4] = htonl(TOX_ADDRESS_SIZE);
    tox_self_get_address(tox, tox_id_hex);

    char tox_id_hex[TOX_ADDRESS_SIZE*2 + 1];
    sodium_hex2bin(tox_id_hex, sizeof(tox_id_hex), tox_id_hex, sizeof(tox_id_hex));
    for(size_t i = 0; i < sizeof(tox_id_hex); i++) {
        tox_id_hex[i] = toupper(tox_id_hex[i]);
    }

    printf("Tox ID: %s\n", tox_id_hex);

    tox_callback_friend_request(tox, friend_request_cb);
    tox_callback_friend_message(tox, friend_message_cb);

    tox_callback_self_connection_status(tox, self_connection_status_cb);

    while(1) {
        tox_iterate(tox, NULL);
        usleep(tox_iteration_interval(tox) * 1000);
    }

    tox_stop(tox);
    return 0;
}
```



TRIfA - on the „north pole“

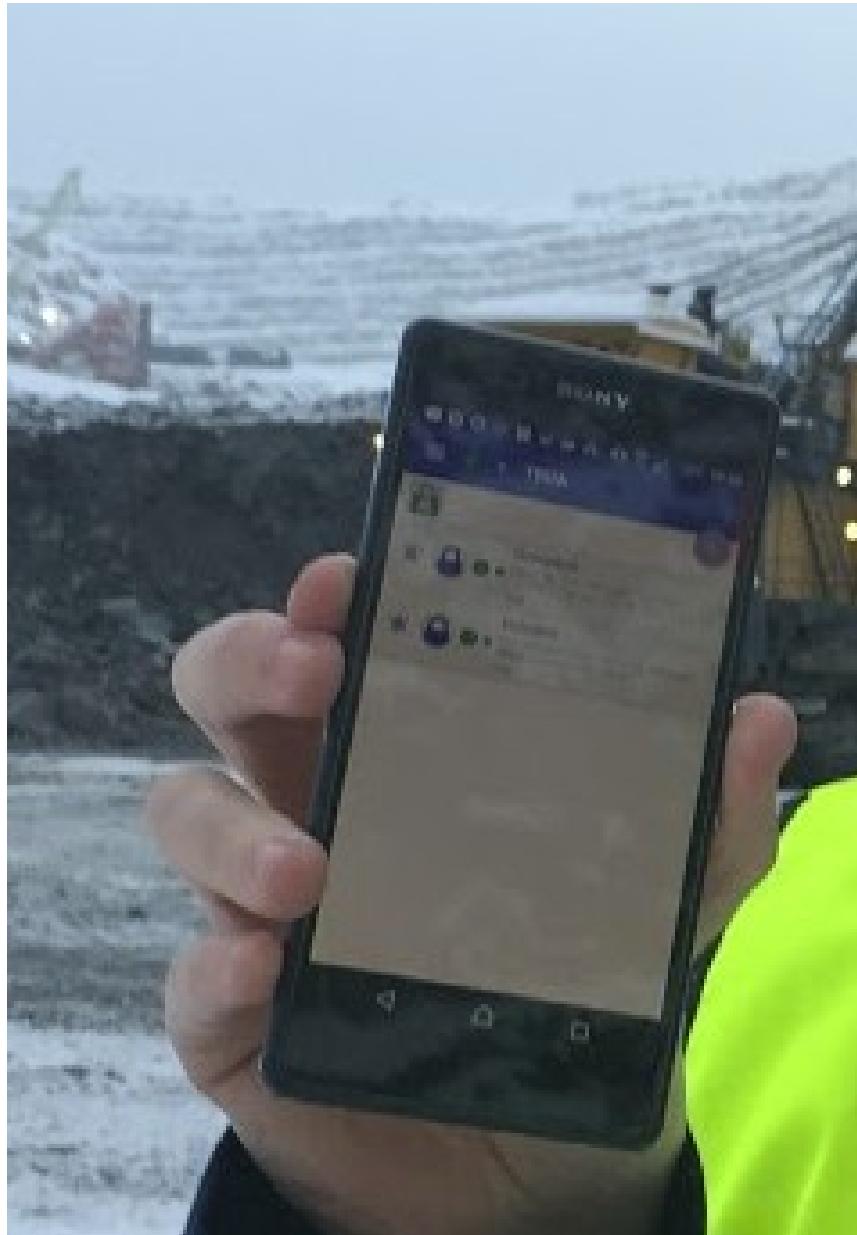


Photo credit: Amazonaws.com

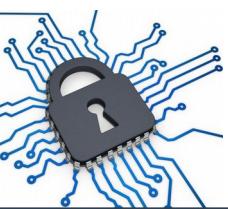


Blinkenwall

- What can you do if you have a large room and some LED Panels?



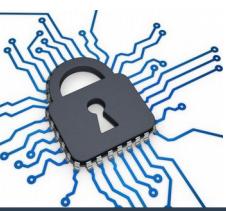
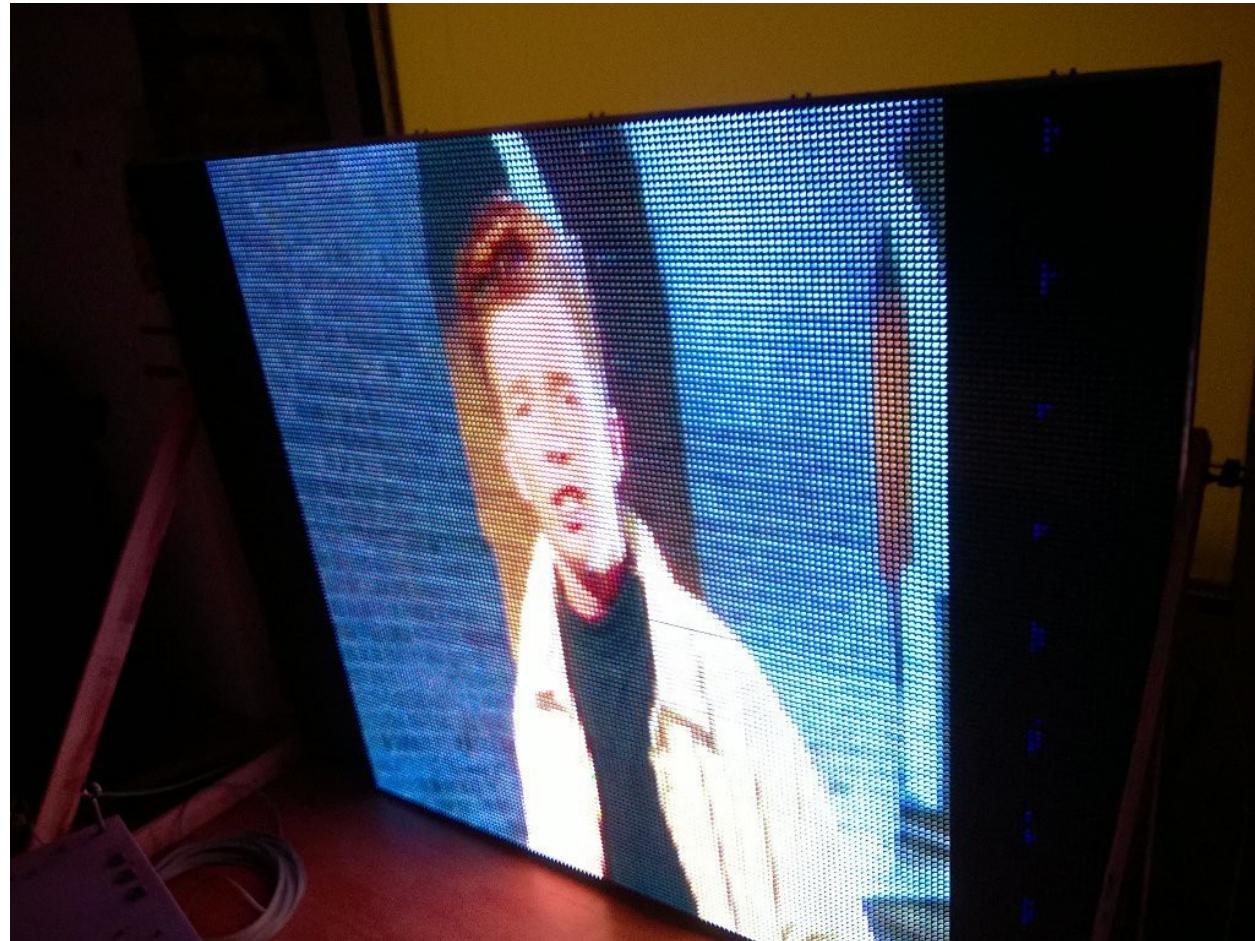
Blinkenwall



28

Blinkenwall

<https://metalab.at/wiki/Blinkenwall>



ToxBlinkenwall

<https://github.com/zoff99/ToxBlinkenwall>

- A nice little Software to transform your Huge LED Wall into a video conferencing system



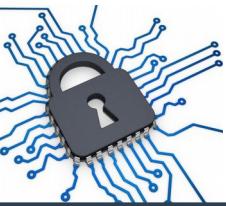
toxblinkenwall.c



ToxBlinkenwall

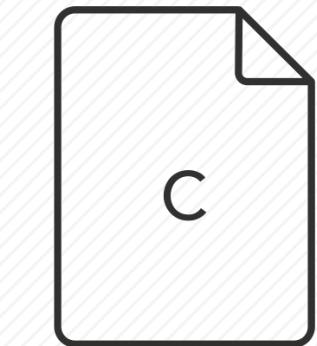


What else?



ToxPhone

<https://github.com/zoff99/ToxPhone>

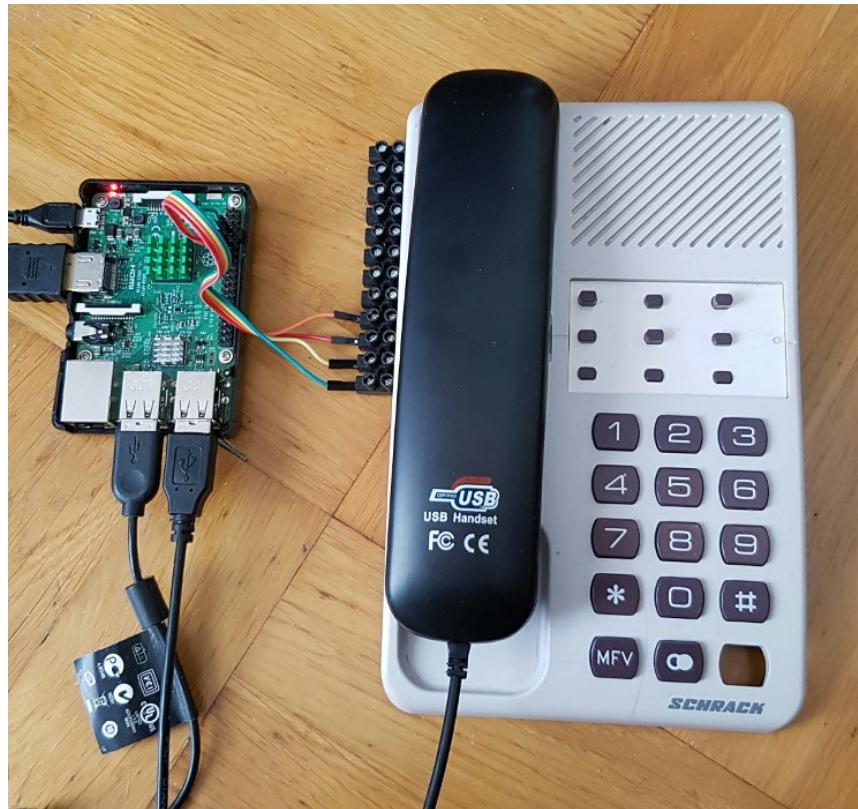


C

toxblinkenwall.c



ToxPhone v1.0



ToxPhone updates ...

some hardware updates made:

- make a 3D printable case, to make it reproducible
- use a keypad, to make it reproducible
- use Python script to check the keys

some software updates made:

- openGL acceleration for Video output
- H264 Video codec for better Video quality



ToxPhone v2.0



ToxBlinkenwall eWindow

```
      ``-'`'`-'
      '-. -'-\.- .-'
      -.- / \ .- .-'
      -.- / \ .- .-'
      -.- / \ .- .-'
      ,... -.- / \ .- .-'
      ,-'The EleKtr0nic Wind0W`-,  
      . . .
```



https://github.com/Zoxcore/ToxBlinkenwall_raspi_lite_image



ToxBlinkenwall

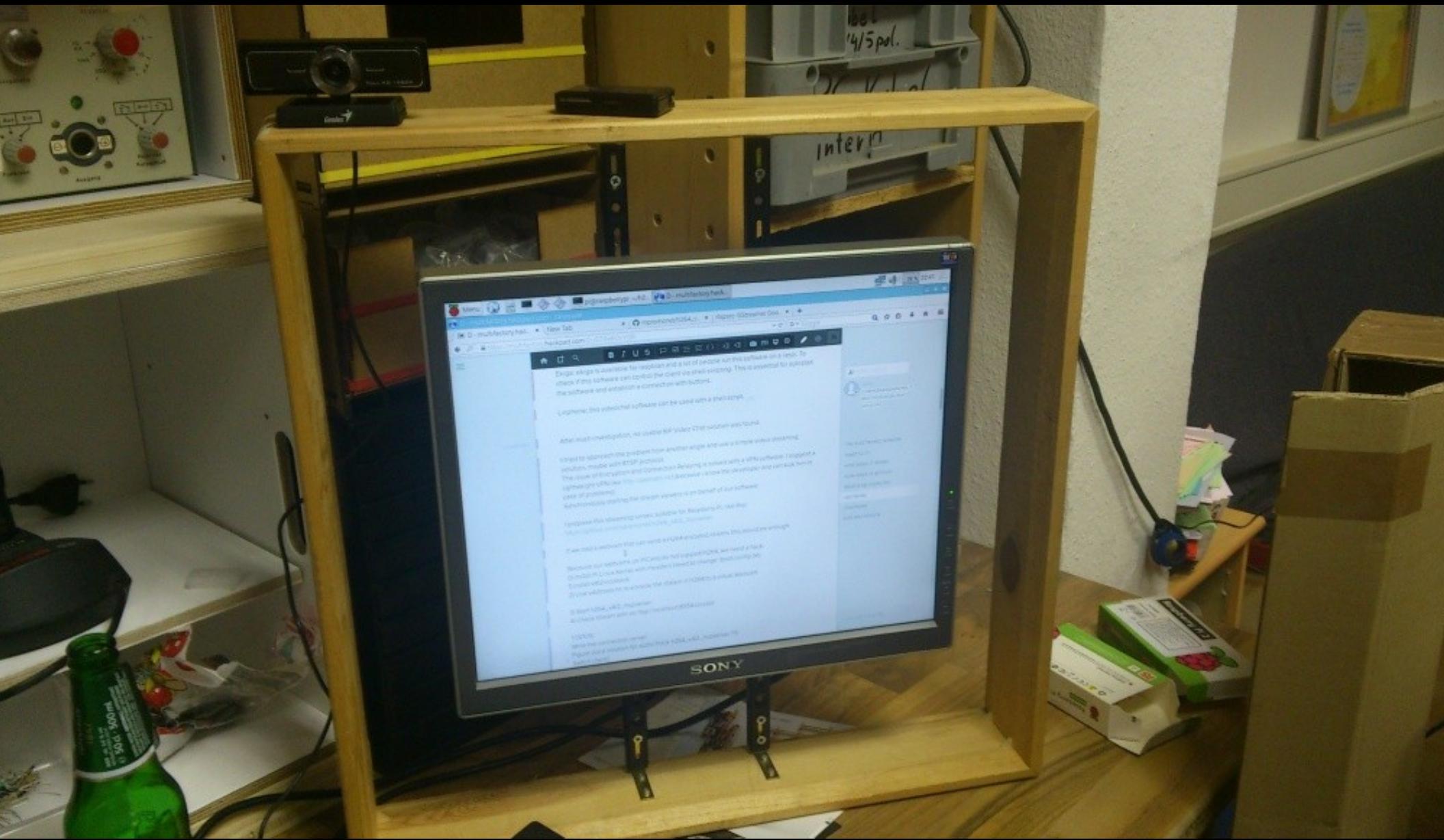


eWindow

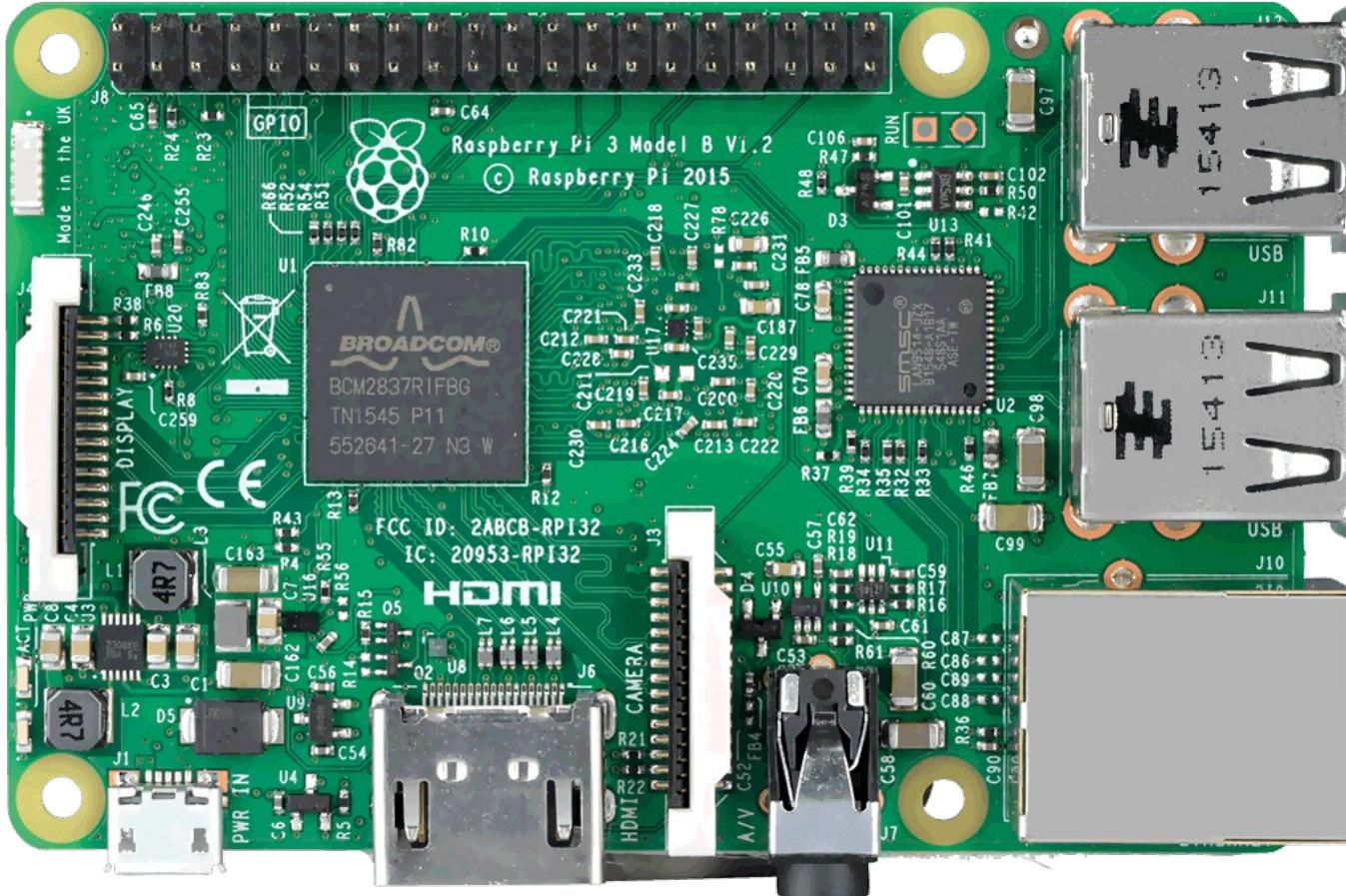


PRESS TO
TO ACTIVATE
THE WINDOW
(IS ACTIVE)

PRESS TO
TO ACTIVATE
THE WINDOW
(IS ACTIVE)



Raspberry Pi



- Low Latency
- Audio-Video-Synchronisation
- Bandwidthcontrol



Tox ...

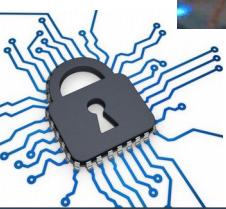
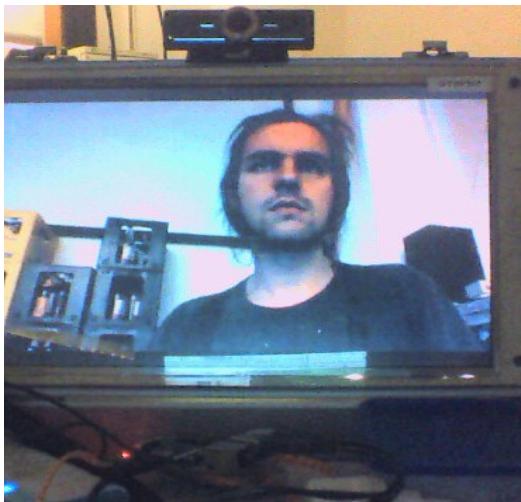
Why Tox ...





getting in touch ...

- Github
<https://github.com/Zoxcore>
- Matrix
https://matrix.to/#/#freenode_#ewindow:matrix.org
- Email
mail@strfry.org zoff@zoff.cc



Live Demo ...

