Exploiting hidden services to setup anonymous communication infrastructures

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My goals

- Explain anonymity concept and different networks
- Explain the potential of exploiting anonymous networks in a different way
- Present the Laissez Faire Island Project and get interests and contributors
- Discuss on how to support the growth of anonymous communication systems with an a-commerce market

What's this talk not about?

- Not go deeper in the technical details of anonymous protocols
- Do not make any promotion of commercial tools

Me

- Underground: member of the s0ftpj group, sikurezza.org italian mailing list, e-privacy and winston smith anonymous communities, and some advisories made for PIX firewalls
- Work: CTO of a swiss privacy provider
- Personally: love for anonymity research!

You

- Who does personally require anonymity?
- Who have ever used TOR?

Agenda

- **Anonymity**
- Anonymity use and abuse
- Anonymous Networks
- TOR - The Onion Router
- Anonymous Backbone Concept
- Laissez Faire Island Project
- LFI MAIL: unconventional approach to anonymous email

Anonymity

What's anonymity

- Anonymity is a state of not being identifiable within a set of subjects
- Big difference between anonymity and confidentiality:
  - Identity protection
  - Location protection
  - Deniability of actions (w.r.t. identity)

What to protect?

The sender/receiver anonymity issues

- Who you are
- Where you are located
- Whom you communicate with
- Where the recipient/ server is located

Most of anon nets protects only the sender!

Good anonymity requires mutual protection

Anonymity require cooperation

- No organization would be ever able to stay anonymous by itself.
  - You can only get confidentiality yourself.

- Anonymous network require cooperation

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Anonymity use and abuse

Personal use

- Discussion of sensible issues
  - sexual attitude
  - religious belief / vision
  - political inquiries
- Avoid tracking and profiling by isp's / corporate / governments / google!

Corporate use

- Business Intelligence activity
- Stop competitive analysis (r&d, procurement)
- Legal discussions
- Communications from non democratic countries and war places
- Journalist communications
- Prevent price & information discrimination

Government use

- Diplomatic communications
  - *Where is the ambassador staying?*
- Anonymous requests by citizen to law enforcers
- Criminal investigation
  - *Oh... FBI is looking at my website!!*
- Stuff in the public interest...

Security Research USAGE

- Security Researchers caught at security conferences
  - Dmitry Sklyarov @ Defcon
  - Stephen Rombom @ Hope
- 20 September 2006: Tron @ Toorcon 8
- First conference over TOR!
- Ventrilo (2k/s voice streaming) + VNC (5-10k/s video streaming) = Alan Bradley & Kevin Flynns talked securely away from the USA/DMCA risks

Abuse (why limits?!?)

- Do only terrorists need anonymity?
  - Hotmail & drafts methods!
  - http://www.jihadwatch.org/archives/002871.php
- Hey... also mafia, pedopornograph, cyber vandals use TOR!
- So we should declare illegal internet, airplanes, child, knifes because it can be abused?
- Adversaries are much less skilled than what we ever thought!

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Anonymous networks

There's too much garbage!

- There are tons of anonymous technologies out there:
  - Few projects got success
  - Few projects grow
- Limitations are mainly related with:
  - Risk context to be managed
  - Deployment & usability

High latency

- Good for store & forward action -> Email
- Anonymous Remailers:
  - CypherPunk type I: old technology, old network)
  - Mixmaster type II: around 35 servers, very stable networks
  - Mixminion type III: experimental networks by freeheaven
  - Nym servers: old school -> anon.penet.fi / nym.alias.net
- Those networks are not email systems: need true, traceable email systems

Low latency

- Good for interactive action -> Web Browsing / Chat
- Onion Routing -> The Onion Router (c)
  - The biggest anonymous network ever known
- I2P (java)
  - Free mixnet
  - Fully distributed (p2p)
  - Variable latency trough I2P API
- FreeNET (java)
  - P2P storage for mutual anonymous content publishing and access. Still too slow

Misc anon networks

- AnoNET
- Crowds
- Invisible IRC
- WASTE
- Entropy
- Mute
- GNUnet
- Winny
- Mnet
- Infrastructure for resilient internet systems
- Rodi
- Marabunta
- Morphmix
- Tarzan
- AntsP2P
- ....

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The Onion Router

Who did make it?

- USA Department of Defense
- Electronic Frontier Foundation

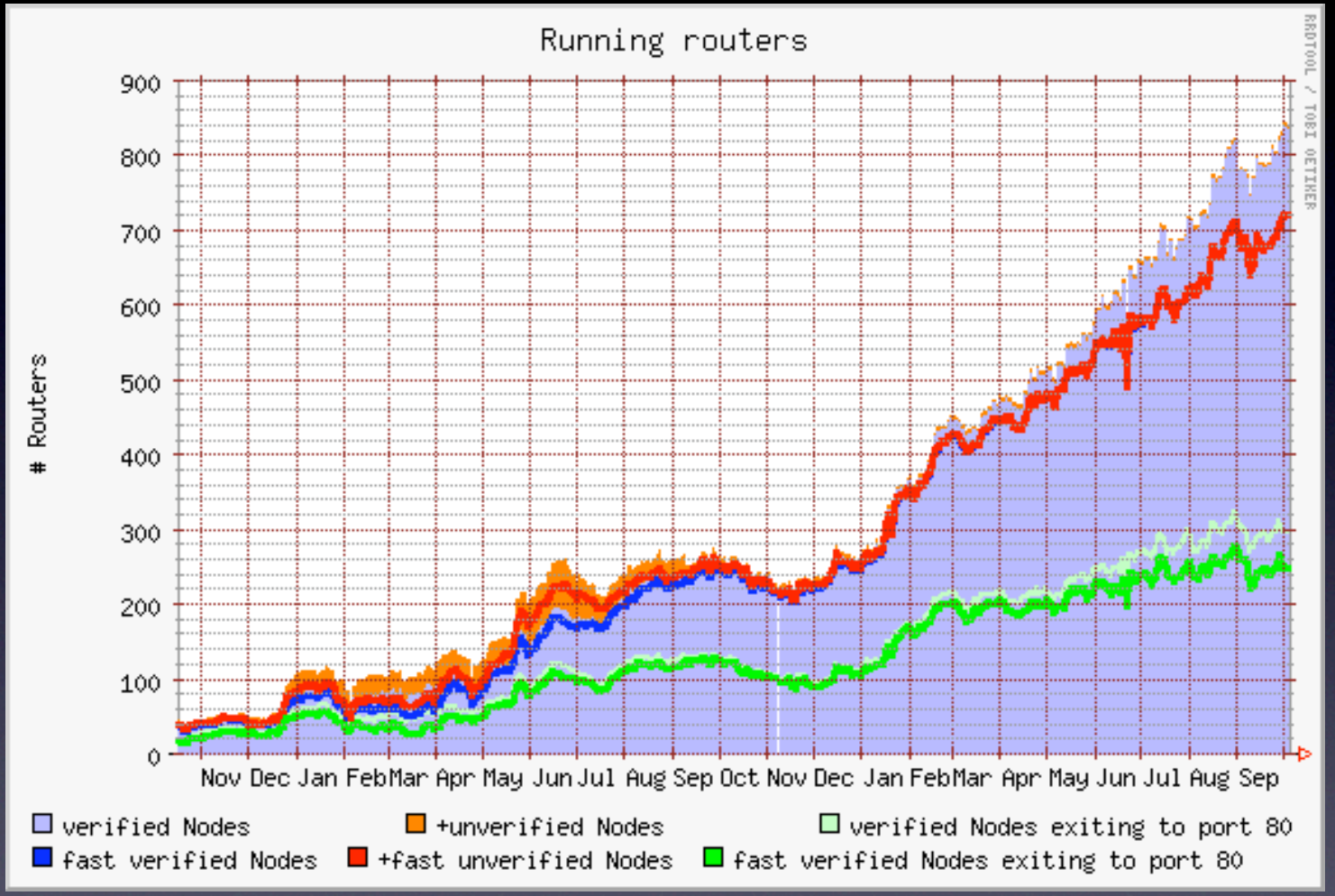
Goals

- Deployability for supporters and users
- Flexibility of the protocols
- Usability for the users
- Simple design of architecture
  - Directory Servers - RendezVous Servers - Users - Tor Servers (Middleman / Exit node)

NOT Goals

- Not peer to peer
- Not secure against end-to-end attacks
- No protocol normalization (Use privoxy!)
- It's filterable
  - Block http request for /tor/* (dir server)
- It's identifiable (TOR-bl, public list of nodes)

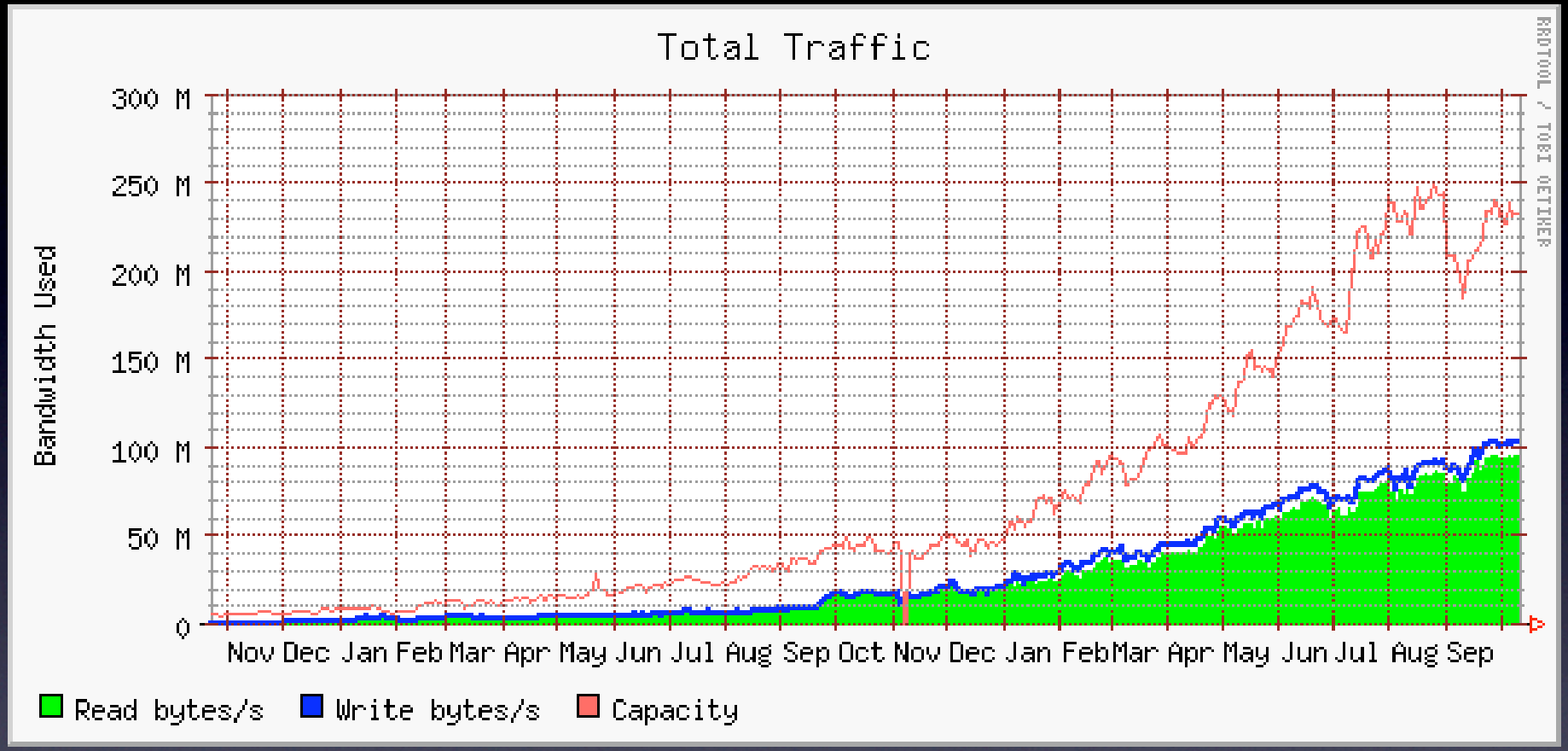
TOR network expansion



last 24 months grow of tor routers

http://www.noreply.org/tor-running-routers/totalLong.html

TOR network bandwidth



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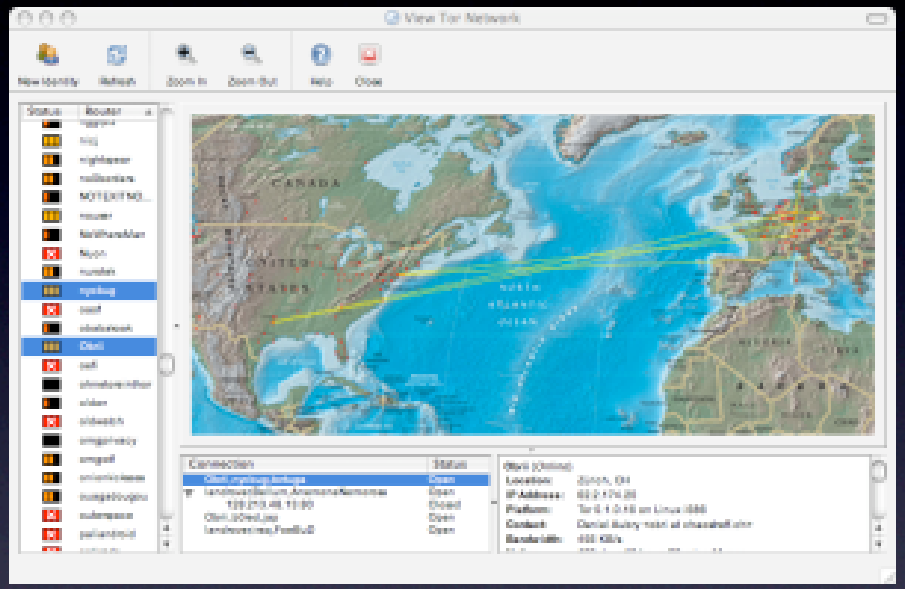
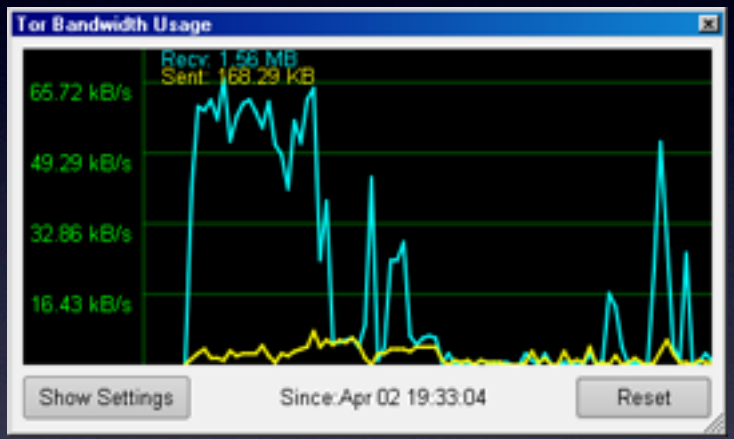
Vidalia

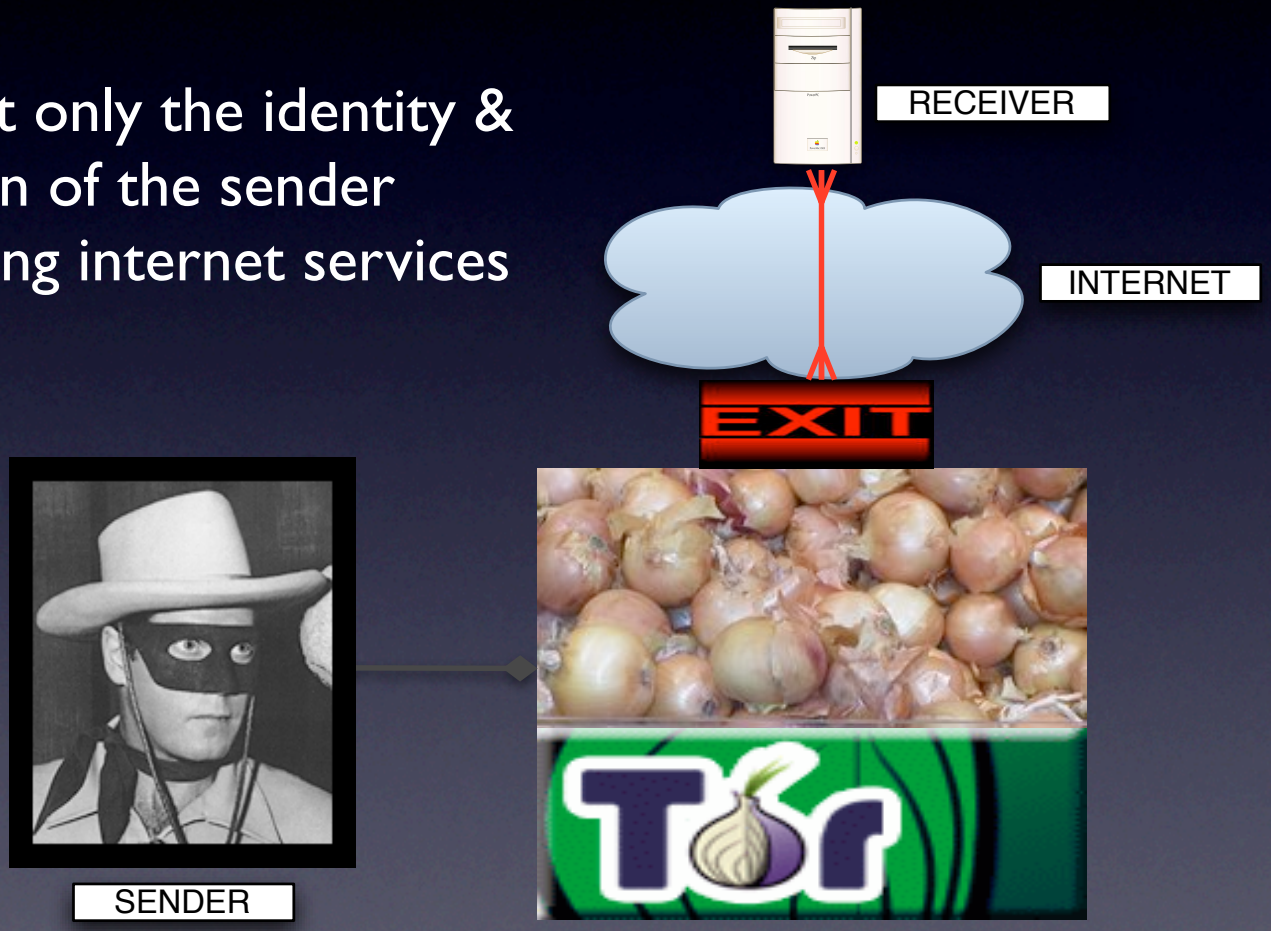




- http://vidalia-project.net
- Status - Stop/Start - Map - Logos - Configuration - Help - Translations - Monitor

TOR tipical use

- Protect only the identity & location of the sender accessing internet services



A look at exit nodes traffic

- Most http, messaging, pop3
- A lot of porn and googling!
- Automated web attacks
- Cinema like telnet! ;)

- EVERY EXIT NODE CAN INTERCEPT NON ENCRYPTED TRAFFIC!
- Paranoid but dumb: https://tor.unixgu.ru/

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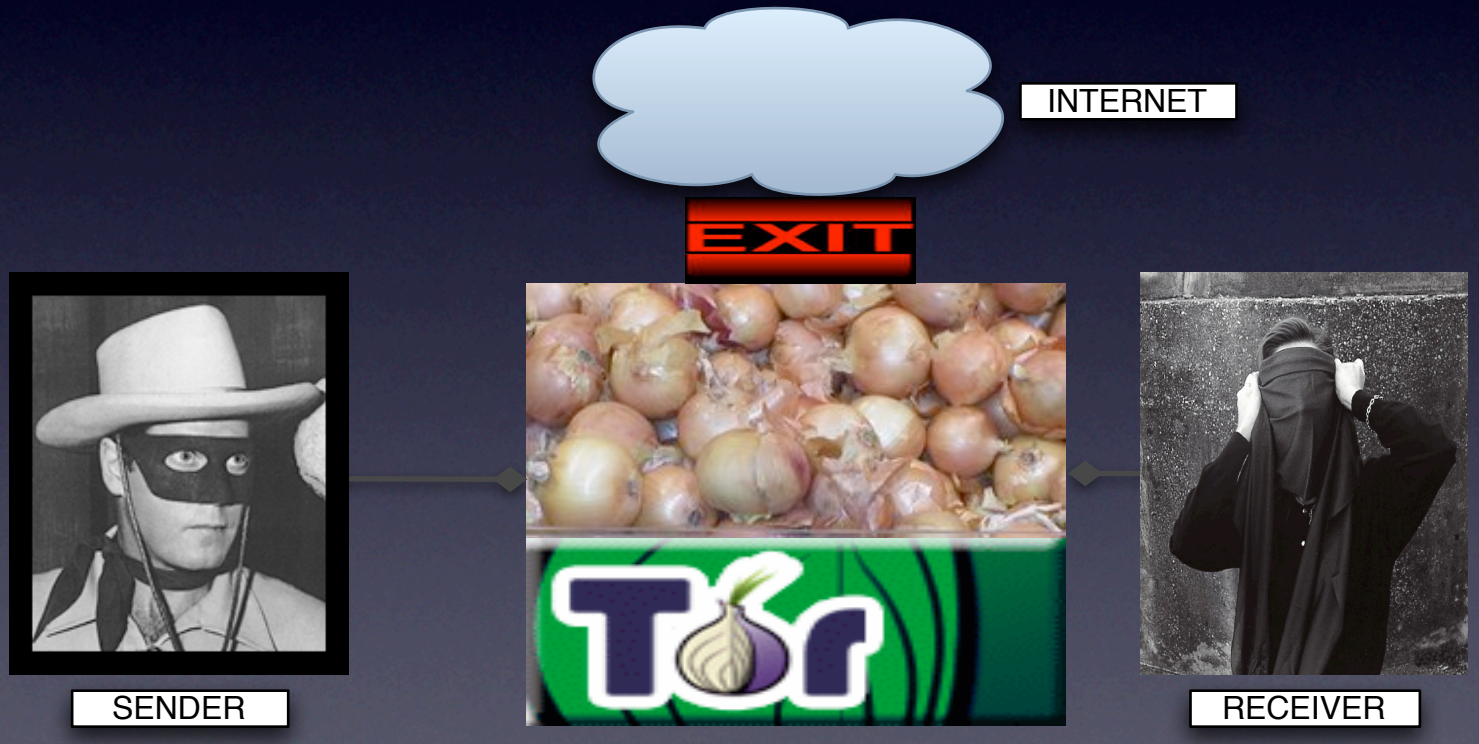
Anonymous internet backbone

Changing the rules

- Consider the Internet as a generic transport media
  - TOR as an anonymous backbone
    - do you know MPLS?
- Mutual anonymous protection
- High performance anonymity
- No more 3 trusted third party!!!

No more 3 trusted party

- Protect the identity & location of the sender AND of the receiver (server) by accessing hidden services.



Onion LAND

- Hidden services are tcp redirects from the running tor client
- Hidden services can be exposed behind NAT
- Latency:
  - New connection: 80ms - 5 seconds
  - Established connection: 700ms - 2 seconds
- .onion TLD for each registered service
- No restriction policy as for Exit Node!

Usability issue

- Make the .onion hostname easier
  - Hidden wiki http://6sxoyfb3h2nvok2d.onion
  - FreeNODE irc irc://mejokbp2brhw4omd.onion
- Application level Internet redirection (not a good way!)
  - http://anon1.xxx.com -> 302 -> http://odkdokdod.onion
- 2nd level TOR rendez vous services
  - Easy hidden url

service limits

- High bandwidth services (video)
- Frequent connections (p2p file sharing)
- Low latency services (telephony)
  - Ok for Push To Talk
  - Serious troubles with full duplex!

Anonymous services

- Develop an anonymous society
- Start doing business with anonymous tools!
- Promote Free and NON-Free anon services:
  - Email hosting
  - Server (physical or virtual) hosting: rayservers, me (free vps)
  - Internet reverse proxy services (easy migration)
    - es: http://serifos.eecs.harvard.edu/proxy/http://6sxoyfb3h2nvok2d.onion
  - Payment provider (egold exchanger, prepaid visa cards)

Thinking anon business

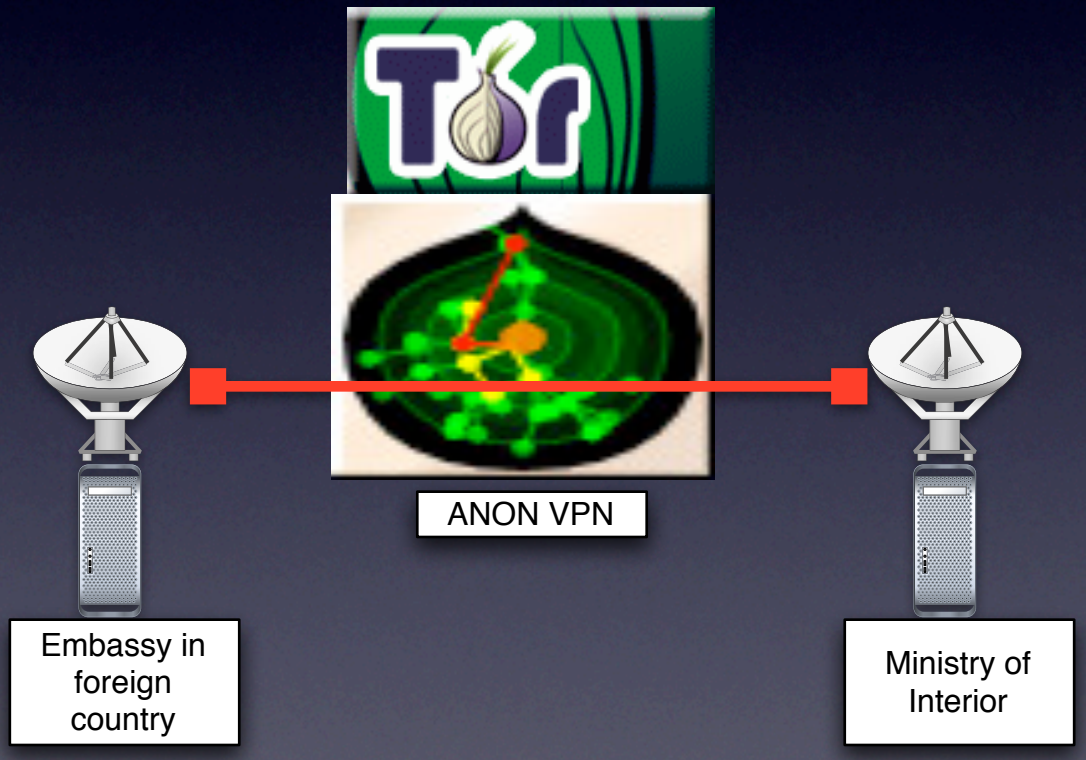
- There are many business to be build around anonymous networks!
- Main issues: availability(b2b) & payment(b2c)
  - Investing % of the income in the network would really improve availability
- Anonymous VPNs
- Anonymous Messaging

Anonymous VPNs (1)

- VPNs are not so private (identity & location) High risk context VPNs are useful in business and personal use
- The anonymous backbone is a nat proof transport media
- Good for email, instant messaging, file services (better webdav with keepalive!) and http resources

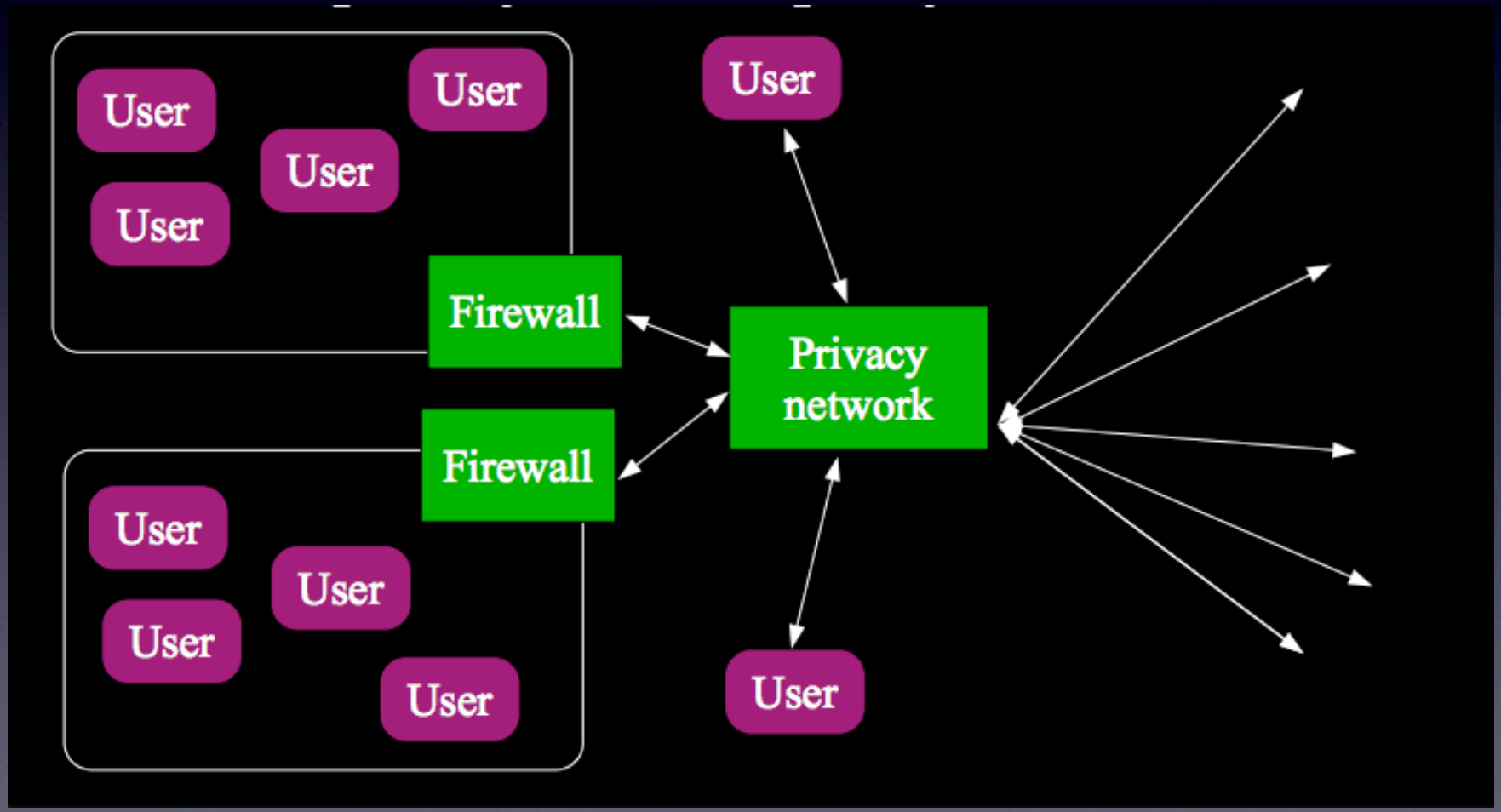
Anonymous VPNs (2)

- Example use: Journalism, Public safety, NAT bypass, non-democratic country branch



Anonymous VPNs (3)

- Place privacy enforcement on the firewalls!



Anonymous Messaging

- Email messaging with anonymous network works really definitely well but...
- No hidden diffused email messaging services
  - xrek (62 users) http://4nc7xi5usjq6z7bc.onion/
  - Tormail down (onion.theme1.com)
- TOR block outgoing SMTP (for spam)!!!

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Laissez Faire Island Project

Laissez Faire City

- Do you remember Laissez Faire City?
- In ’95 a group of cyber/economist fanatic created a new sovereign international cyber city
- Developed a privacy infrastructure to allow individual to operate in the freedom of cyberspace outside the confines of the traditional nation-state
- Declaration of the independence of CyberSpace
  - http://homes.eff.org/~barlow/Declaration-Final.html
- A mix between crypto-anarchism and anarcho-capitalism

Laissez Faire City

- Mailvault - www.mailvault.com - YodelBank -
- DMT - Digital Monetary Trust
  - DMT ALTA - Asset Lodgement Trust Accounts
  - DMT LESE - Laissez-Faire Electronic Stock Exchange
- ICA - International Contract Registration
  - http://ica.citystateinc.com/
- CEP - Common Economic Protocol
  - http://cep.metropipe.net/

Laissez Faire Island

- Laissez Faire Island aims to became a small piece of land in the sea of anonymity
- We want to create and stimulate the creation of anonymous social environments
- TOR gives us the chance to do that!
- Laissez Faire Island is a baby!
  - We need a logo!

Laissez Faire Island

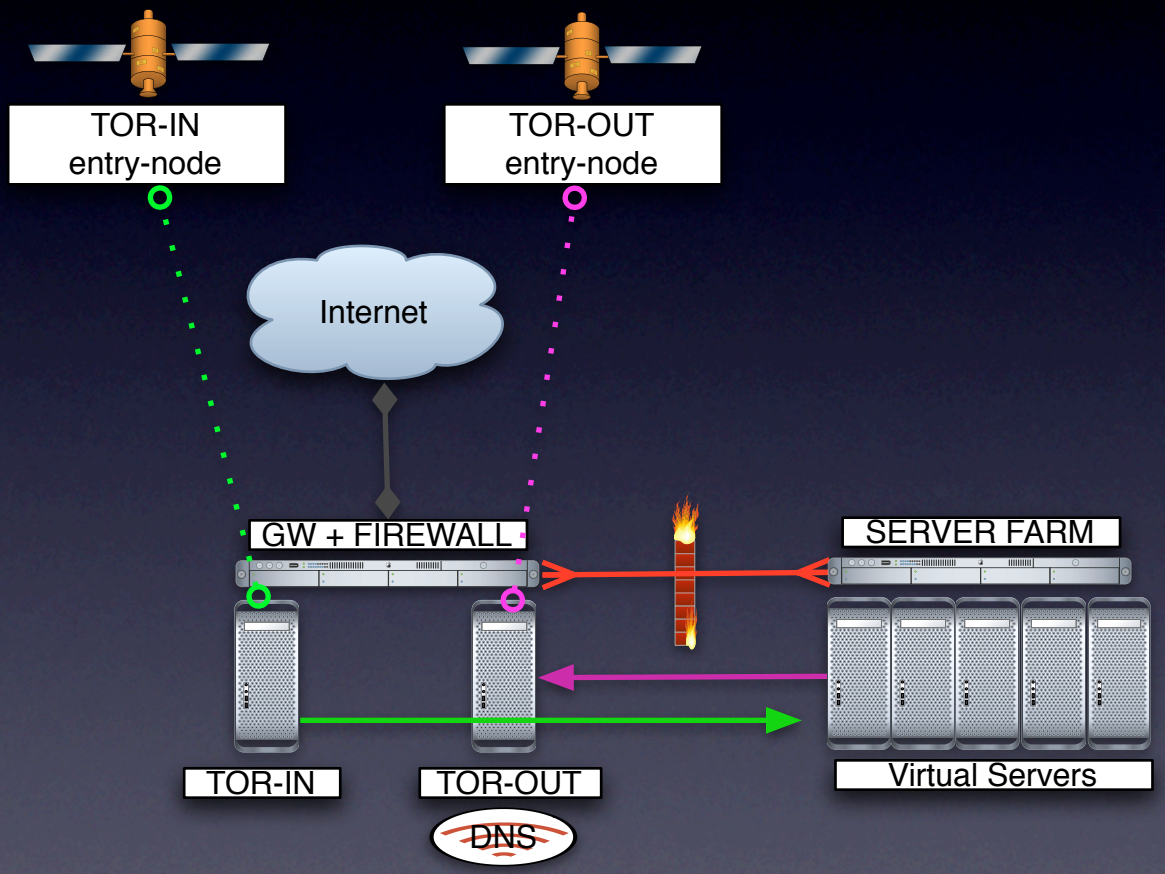
- Laissez Faire Island require infrastructures!
- Several islands are required to born before service network can be really effective!

- We provide free virtual private server for anonymous services!
  - Get one and setup free a service!

LFI Architecture (1)

- How to implement a Laissez Faire Island?
  - Be 100% sure that no one would be able to discover where it is!
  - Be 100% sure that incoming traffic follow a different path respect to outgoing traffic
  - Differentiate services and traffic routing!
  - Use virtualization technology (XEN)

LFI Architecture (2)

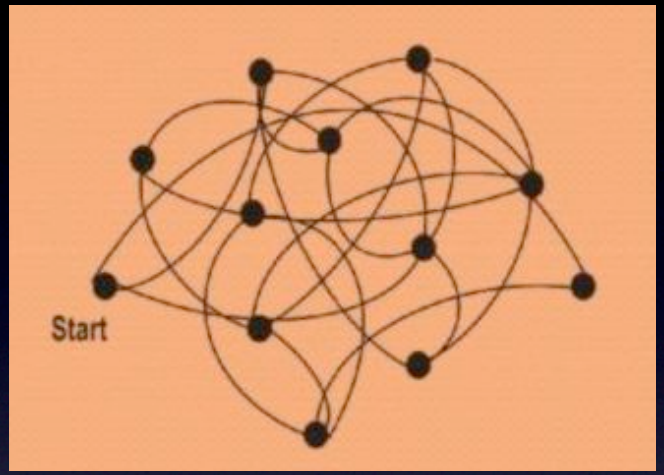


- Carefully select TOR-IN / TOR-OUT

LFI Architecture (3)

- TOR CVS simplify the setup
  - TransPort 9040 + iptables/iproute2
- DNS servers
  - tor-dns-proxy.py (dugsong)
  - dns-proxy-tor (http://p56soo2ibjkx23xo.onion/)
- Iptables / iproute2 for network policy/redir
- Dynamic firewall script for tor-only traffic
- Dmcrypt-luks for disk encryption

We want your island!



- Setup your island!
- Came with us!
- Build a redundant and solid Anonymous Infrastructure!
- Availability & distribution are key features!

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Laissez Faire Island Email Platform

An old need

- Before spam, people thought anonymous email was a good idea:
  - David Chaum. “Untraceable electronic email, return address and digital pseudonyms”. Communications of the ACM, 1981

LFI MAIL GOAL

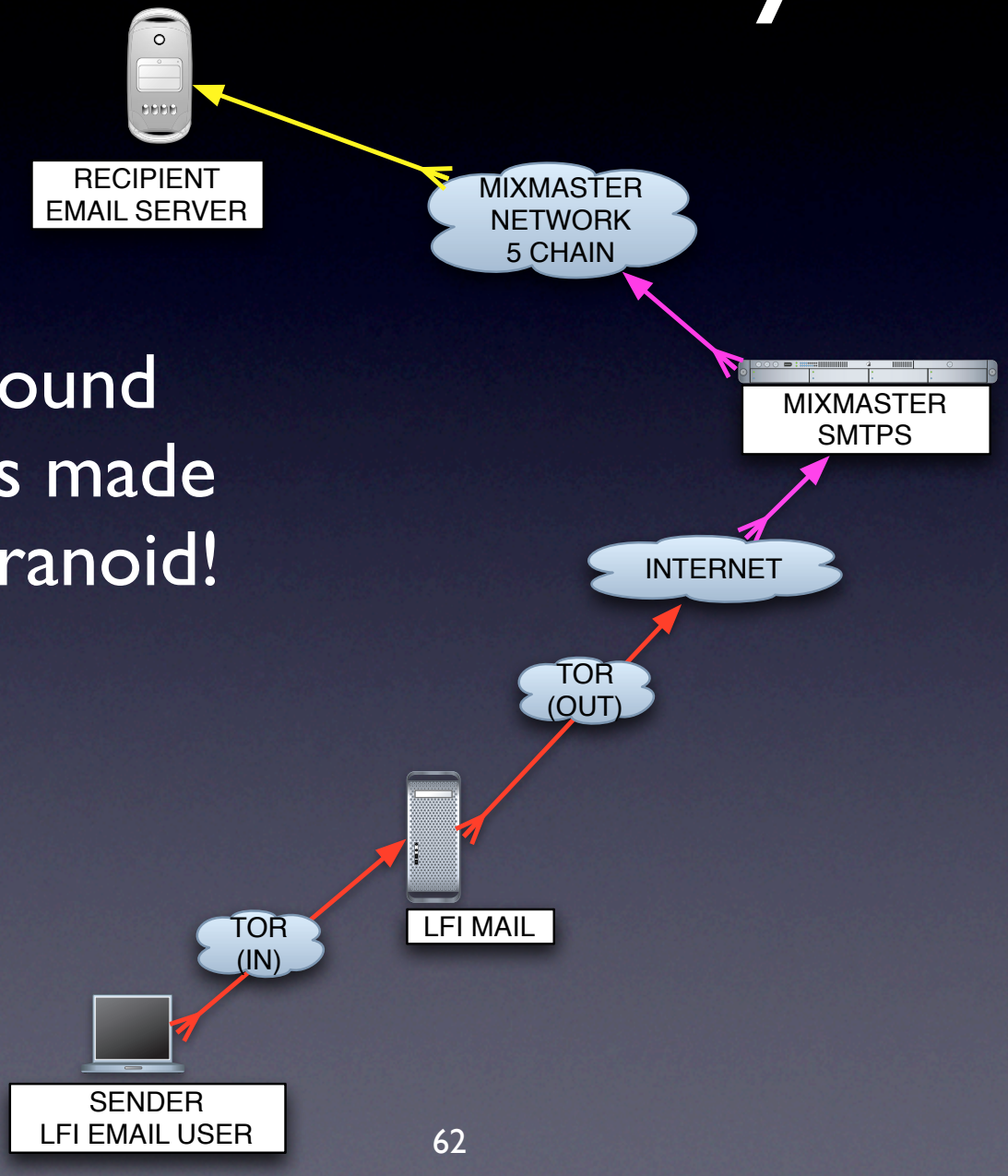
- Provide anon email services through a network of redundant servers located in many **islands of the sea of anonymity**
- Escape from the net: stay in the islands!
- internal communication (simple)
- external outbound communication (complex!)
- external inbound communication (very complex!)

Escape from TOR

- TOR exit nodes block outgoing SMTP but...
- **SMTPS (465/tcp) is allowed!**
- **19/35 Mixmaster anonymous remailer nodes support SMTPS !**
  - http://www.noreply.org/tls/
- We mix the best we can get from different anonymous networks!

LFI MAIL: anonymix!

External outbound communications made easy & more paranoid!



LFI MAIL sw

- An email system quick to be setup) (www.kolab.org)
- Mixmaster & smtp2mix
- Horde Webmail (+mod_security +mod_chroot)
- Simple signup system
- Upcoming: automatic encryption (anubis)

Still no internet inbound

- Having a unique inbound internet-to-TOR gateway would expose the system to interception
- Inbound connection would require an high number of information nodes around the world giving their IP
- Idea! Ask TOR-ops/Mixmaster-ops to redirect 25/TCP port to the network of islands!
- DNS MX Record: 900 results around the

future useful ideas

- Old school shell server
- Conference streaming platform
- Proxy middleware to avoid tor exit issues
- Free "Exit Node" pcap dump for all!
- TOR development
  - Hidden Service Round Robin
  - Easy 2nd level rendez vous services

Questions?

- Contribute and share your passion!
- wiki http://vbp22opdeypalsic.onion
- naif@vbp22opdeypalsic.onion (beta LFI mail)
- Internet: naif@s0ftpj.org
- Get TOR! http://vidalia-project.org