GNUnet for mesh communities

2016-05-04

BattleMesh v9, Porto

Daniel Golle <daniel@makrotopia.org>

Why bother?

Because a community mesh reality goes beyond wireless and routing algorithms

- Laggy (and costly) VPNs

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Because a community mesh reality goes beyond wireless and routing algorithms

- Laggy (and costly) VPNs
- Evil firewalls/NAT
- ‘just use 8.8.8.8’
- ‘use Tor if you need privacy’

security and privacy

in contemporary community mesh networks

depends a lot on personal awareness and manual configuration

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- macchanger

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- macchanger
- dnscrypt

security and privacy

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depends a lot on personal awareness and manual configuration

- macchanger
- dnscrypt
- Tor/VPNs

security and privacy

in contemporary community mesh networks

no built-in security model in most mesh routing algorithms*!

*expections: BMX7

security and privacy

in contemporary community mesh networks

no built-in security model in most mesh routing algorithms*!

→ DoS or inserting malicious routes is trivial

Comparision

community mesh

vs.

commercial ISP

security and privacy

in contemporary community mesh networks

Comparision

community mesh

vs.

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when accessing things on the web

Comparision

when accessing things on the web*

***which is the most popular and sometimes only application of community mesh networks**

security and privacy

in contemporary community mesh networks

Typical community Mesh Network	Typical Commercial ISP
Traffic routed through VPNs: (small set of) static source address(es) for all users of the mesh	Dynamic IPv4 address in a pool shared with tenthousands of users, only ISP can map temporary addresses to users
Layer-2 MAC addresses and DHCP leases (containting hostnames and UIDs) may leave local administrative scope	Routing and NAT on Layer 3, MAC addresses and details about clients shouldn’t leave local realm (hopefully)
All other users may easily intercept or even maliciously re-route traffic	Central authority (ISP) governs routing, carriers involved on the way may intercept traffic (practically: any large TIER)
Informal hierachries and knowledge-gap decide over priviledges	Cooperate hierachies and profit decide over priviledges

security and privacy

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Typical community Mesh Network	Typical Commercial ISP
Traffic routed through VPNs: (small set of) static source address(es) for all users of the mesh (hundreds)	Dynamic IPv4 address in a pool shared with tenthousands of users, only ISP can map temporary addresses to users
Layer-2 MAC addresses and DHCP leases (containting hostnames and UIDs) may leave local administrative scope	Routing and NAT on Layer 3, MAC addresses and number of clients shouldn’t leave local realm (hopefully)
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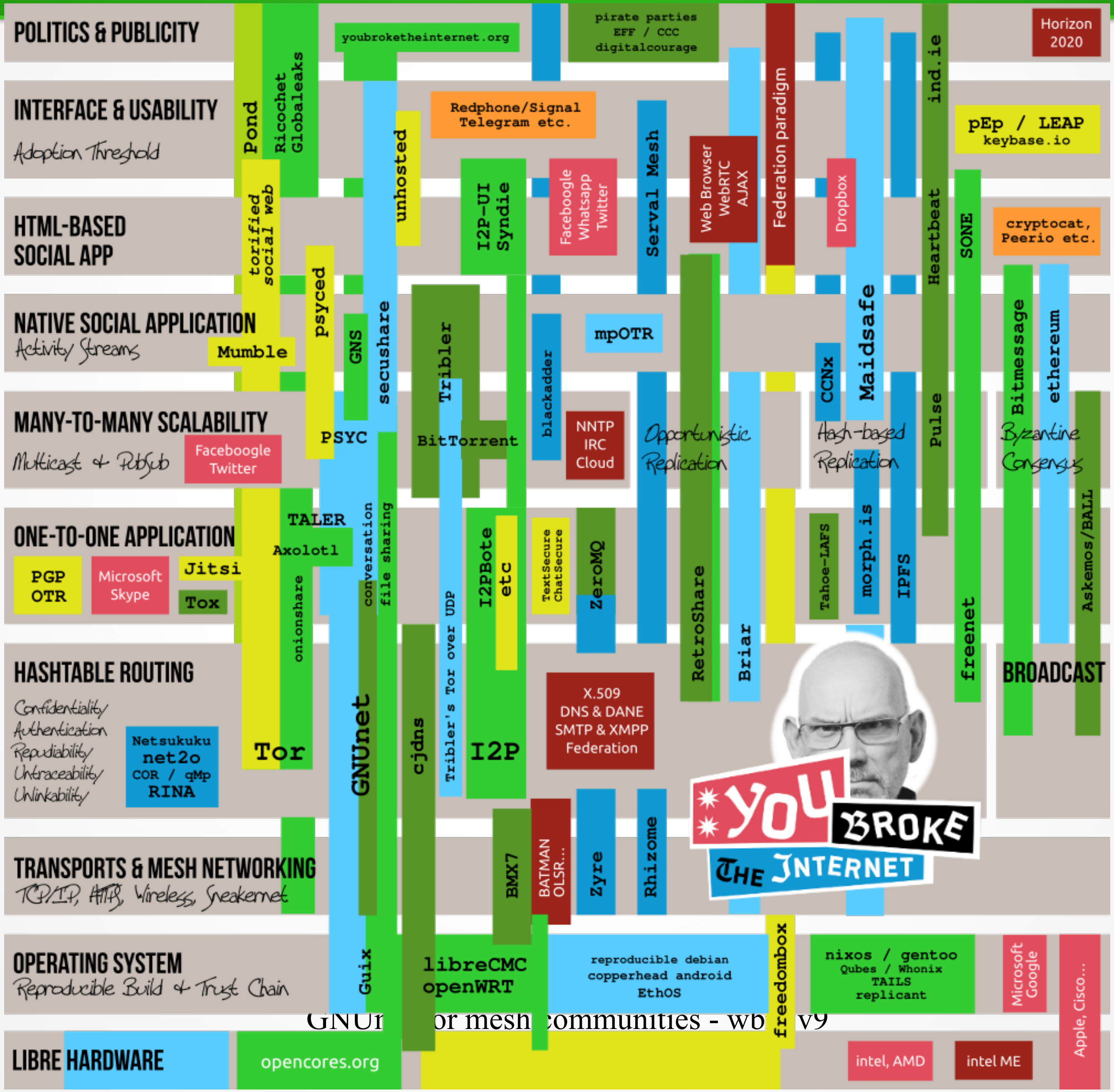
youbroketheinternet.org



POLITICS & PUBLICITY

INTERFACE & USABILITY
Adoption Threshold

HTML-BASED SOCIAL APP

NATIVE SOCIAL APPLICATION
Activity Streams

MANY-TO-MANY SCALABILITY
Multicast + PubSub

ONE-TO-ONE APPLICATION

HASHTABLE ROUTING
Confidentiality
Authentication
Repudiability
Untraceability
Unlinkability

TRANSPORTS & MESH NETWORKING
TCP/IP, HTTPS, Wireless, Sneakernet

OPERATING SYSTEM
Reproducible Build + Trust Chain

LIBRE HARDWARE

youbroketheinternet.org

pirate parties
EFF / CCC
digitalcourage

Horizon 2020

Pond

Ricochet
Globaleaks

Redphone/Signal
Telegram etc.

unhosted

Serval Mesh

Web Browser
WebRTC
AJAX

Federation paradigm

Dropbox

ind.ie

pEp / LEAP
keybase.io

torified social web

I2P-UI
Syndie

Facebookle
Whatsapp
Twitter

Heartbeat

SONE

cryptocat,
Peerio etc.

psyced

GNS

secushare

Tribler

mpOTR

CCNx

Maidsafe

Bitmessage

ethereum

Mumble

blackadder

PSYC

BitTorrent

NNTP
IRC
Cloud

Opportunistic Replication

Hash-based Replication

Pulse

Byzantine Consensus

Faceboogle
Twitter

TALER

Axolotl

conversation
file sharing

PGP
OTR

Microsoft
Skype

Jitsi

Tox

onionshare

I2PBote
etc

TextSecure
ChatSecure

ZeroMQ

Tahoe-LAFS

morph.is

IPFS

Askemos/BALL

Tribler's Tor over UDP

RetroShare

Briar

freenet

BROADCAST

Netsukuku
net2o
COR / qMp
RINA

Tor

GNUnet

cjdns

I2P

X.509
DNS & DANE
SMTP & XMPP
Federation

BMX7

BATMAN
OLSR...

Zyre

Rhizome

Guix

libreCMC
openWRT

reproducible debian
copperhead android
EthOS

freedombox

nixos / gentoo
Qubes / Whonix
TAILS
replicant

Microsoft
Google

Apple, Cisco...

opencores.org

intel, AMD

intel ME

GNUr or mesh communities - wb v9

secu

Tri

blackadd

CCN

Ma

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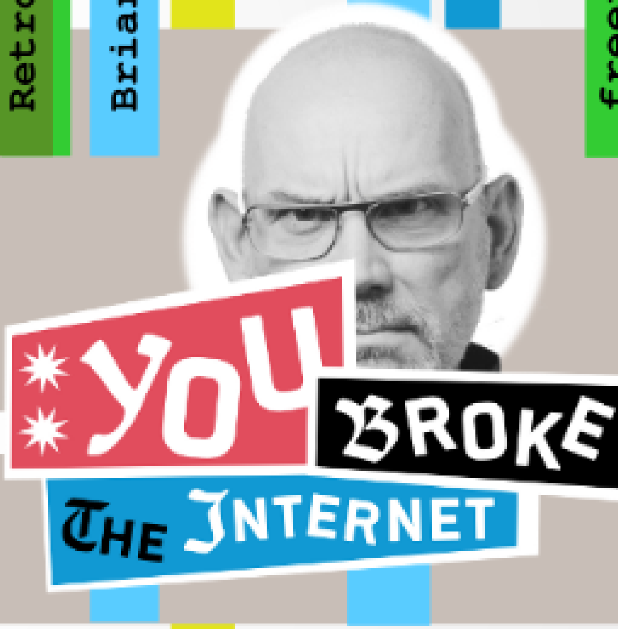

TRANSPORTS & MESH NETWORKING

TCP/IP, HTTPS, Wireless, Sneakernet

BMX7

BATMAN
OLSR...

Zyre

Rhizome

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libreCMC
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reproducible debian
copperhead android
EthOS

freedombox

nixos / gentoo
Qubes / Whonix
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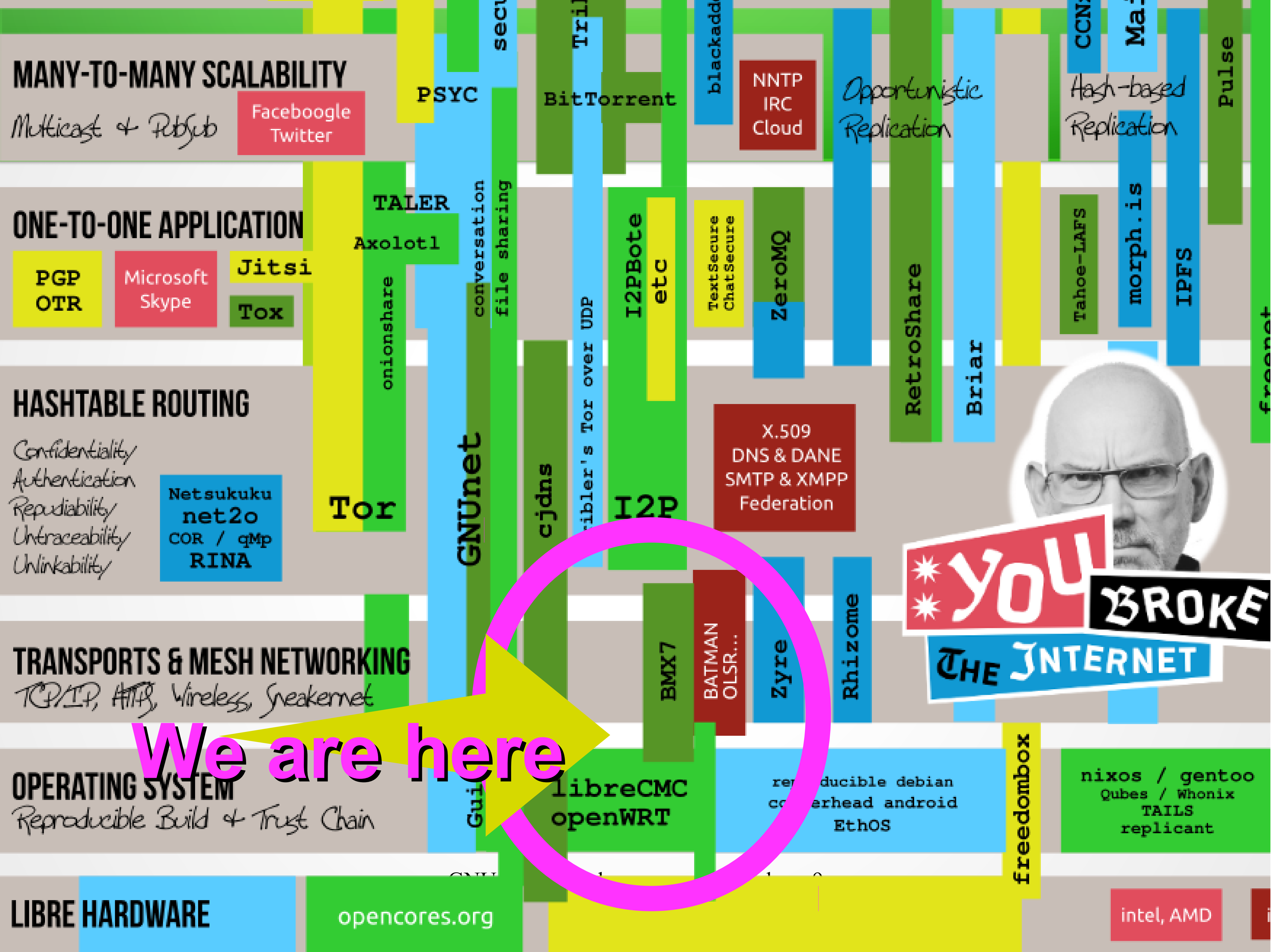
intel, AMD



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We are here

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intel, AMD

services inside mesh structures could (and maybe should) be implemented in a fundamentally different way than cloud (centralized) services

Architectural considerations

(users of) cloud services lack autonomy

default route failing

=

users potentially able to communicate directly end up isolated

Architectural considerations

we need fault tollerance, graceful degradation and all those buzzwords the Erlang crowd has been preaching for over a decade...

Architectural considerations

X.509 (and thus TLS) is broken

what we need is some sort of distributed PKI

Architectural considerations

DNS is broken*

we need a decent distributed naming system

*DNSSec doesn’t help it, new TLDs also won’t help.

We need autonomous distributed applications

- to provide robust tools for self-organization
- to architecturally avoid all kinds of surveillance and censorship
- *endless list of pathetic arguments, democrazy, freedom-of-speech and all that*

We need autonomous distributed applications

what would an IoT light-switch you can trust have to look like?

Picture: Belkin WEMO Maker™

We need
autonomous distributed applications

don't tell me you are going to rent your own server in a datacentre for a lightswitch…

or that you really believe that port-forwarding/UPnP, dyndns and ssh can beat them all and forever

We need
autonomous distributed applications

GNUnet or other secure P2P frameworks may be what you are looking for!

We need
autonomous distributed applications

‘But P2P eats our bandwidth and gives us legal trouble, I don’t want that!’

We need
autonomous distributed applications

‘most P2P tools didn’t work well in my mesh environment when I last tried (years ago)’

GNUnet

A general purpose modular P2P framework written in C.

GNUnet

- Lots of papers

GNUnet

- Lots of papers
- Some (mostly up to date) Documentation

GNUnet

- Lots of papers
- Some (mostly up to date) Documentation
- Lots of code :)

GNUnet goes embedded

OpenWrt port started in 2015 for wbm v8

- Focus on modularity
- mostly stateless / selective persistency
- UCI integration
- (basic) netifd integration
- (basic) firewall3 integration

GNUnet goes embedded

- ✓ core (~700kb) and 20+ modules packaged
- ✓ all transports and services work
- ✓ tunneling/VPN works
- ✓ Exit-to-ARPAnet setup works
- ✓ DNS-interception based integration of the GNUnet naming system works (still a bit tricky)
- ✓ sharing/updating, searching and downloading files/folders works
- ✓ Audio conversation maybe works :)

GNUnet

Screencast

GNUnet future

- ‘social’ pub/sub API and CLI tool
- multi-user IRC-like chat based on PSYC working on top
- ‘consensus’ voting/contract system
- RESTful API

GNUnet embedded future

- More documentation
- Even further split things
- Testing! (volunteers needed)

GNUnet wireless future?

Current injection-based wifi transport very slow due to missing rate-control

➔Use Ad-Hoc, P2P or 11s interface instead, extract metrics from lower layers

GNUnet mesh future?

GNUnet has it’s own mesh-routing transport called ‘dv’

Online resources

- https://gnunet.org
- https://github.com/dangowrt/gnunet-15.05
- http://secushare.org/

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