node-config: Status Update
A simple approach for roaming in l3-meshes

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Wireless Community Weekend 2018
Berlin

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Agenda

1. Recap: Motivation & Requirements
2. Sketching node-config’s network
3. New features (since WCW 2017)
4. Outlook & future work
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Back in 2011

• We need a Freifunk network in Cologne!
• How is it supposed to look like?
  • B.a.t.m.a.n. Advanced sounds interesting — go for it.
  • CCC e.V. provides Internet-Exit
• Requirements ...
Ideas back in 2011

Requirements

1. Hackerspace project, No service mentality — no Service-Level-Agreements
2. Philosophy: We build our network.
3. Scaling: a few hundreded nodes
4. Feature: IP address of node-owner is masked
5. Easy to set up, no configuration of nodes, updates are easy

Basic principle:

• Network for education, hacking, research, non-commercial
• Mistrust authority — promote decentralization

If: we build network good enough and write a proper documentation

Then: others will build the same network and we can connect
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Then: others will build the same network and we can connect
What happened next?

- Forked Freifunk Lübeck’s firmware (2011), joined work on docs.
- Others started building similar networks
  - Düsseldorf (FFRL e.V. 2012)
  - Frankfurt / Magdeburg (a.M. 2012)
  - Troisdorf (2014)
  - Euskirchen (2014)
  - ...

Alright?
Hallo, liebe Mitstreiter!

Ich habe heute an prominenter Stelle (Hohenzollernring) mit viel Außengastronomie einen WDR-3600 temporär in Betrieb genommen.

Erste Tests gerade waren sehr ernüchternd. Speed-Tests lieferten um die 0,3 mbit downstream oder brachen dank Paketverlusten vorzeitig ab. Eine Nutzung des Internets -- unserer Haupt-Anwendung nicht sinnvoll möglich.

Es scheint, als sei unsere Infrastruktur endgültig ausgereizt.

Hat jemand von euch Ambitionen und / oder einen Plan, die Situation zu verbessern?

Ich bitte um Vorschläge!
How does it look like: IPv4 on top of batman-adv

OSI-3 – IPv4

Mesh 172.27.0.0/18

IP: 172.27.8.1
DHCP: 172.27.8.10 - 172.27.15.255

fastd3
IP: 172.27.255.9
Announce: 172.27.8.0/21

fastd4
IP: 172.27.16.1
DHCP: 172.27.16.10 - 172.27.23.255

Tor
IP: 172.27.255.10
Announce: 172.27.16.0/21
0.0.0.0/0

Paul
IP: 172.27.255.3
Announce: 0.0.0.0/0

Tinc 172.27.255.0/24
Service quality

Back to the complainer’s mail

• No answer as of today
• Diagnosis: futile
• WTF? - Just use $vpn-provider for your node.

But there’s a different in culture:

• Use-case: hacking vs. providing high speed internet access
• Is 300 KBit/s slow?
• I fix a problem vs. who fixes my problem?

Resume:

• People can build networks, now
• But they depend on a hackerspace’s infrastructure
• ... and it is fragile :-(
• We became administrators → the authority :-(

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What’s problem?

- Technically
  - Overloaded supernodes, gateways
  - `batman-adv on vpn`: Well, ...
  - `single default route`, `single server in a single datacenter`.

- Socially
  - Only a few understand technical details & internas.
  - Steep learning curve
    (server, infrastructure, technology)
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What should be different?

In the design

• Keep it simple and stupid (KISS)
• Sharing internet using an arbitrary ISP / VPN-Provider
• Scales up to $n \times 10000$ nodes
  • Communities: no need for infrastructur (server, datacenter,...)
  • Less technology needed (Ansible, BGP, ...)

In the architecture

• No separation nodes ↔ Supernodes
• Routing using babel, roaming using batman-adv
• Firmware: Just lede + configuration
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   Recap
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2 Sketching node-config’s network
   Requirements
   Network design: Some details
   Network Interface Configuration
   IPv6 / Multihoming
   Roaming
   Routing (Freifunk community)

3 New features (since WCW 2017)
   New features
   Demo

4 Outlook & future work
Network Interface Configuration

Network design: Some details

Sketching node-config’s network

Recap: Motivation & Requirements

New features (since WCW 2017)

Outlook & future work

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IPv6 / Multihoming

Dealing with different IPv6-networks (ISPs / VPN-Providers)

- Different internet uplinks → different subnets
- ISPs distribute IPv6 using prefix delegation (DHCPv6 PD)
- Challenge: Re-distribute IPv6 prefixes & routing
  - Babel supports source specific routing
  - Prefix-delegation using the ad-hoc (or 802.11s) network
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Roaming

Dealing with clients moving from one node to another

• Roaming using batman-adv → two different mesh protocols
• No broadcasts within a batman-adv-segment
  • ARP via distributed ARP-Table (DAT)
  • ICMPv6 NS via cache (Assumption: works)
Roaming: batman-adv vs. L3roamd on gluon

- Using l3roamd as an option
  1. Publish a babel host routes for each client
  2. Maintain state: Using different daemons (l3roamd)
  3. Distributed anycast setup for dhcp and default routes

- Consequences
  1. No soft migration path — no integration into batman-adv / gluon networks.
  2. Large babel routing tables carrying host routes
  3. Less load nodes: No ebtables required
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Freifunk-Routing

How to reach clients in to different segments?

- End-To-End: Client, Nodes
  - Connecting segments with no wireless contact?
  - Using the Inter-City-VPN (ICVPN)

- Idee:
  - IPv6 ULA FTW!
  - Babel as IGP (i.e. using fastd)
  - BGP as EGP, iBGP (eventually)
New features (since WCW 2017)

1. Sharing internet without VPN-providers
2. VPN offloader / supernode configuration template
3. Integration of Freifunk Berlin's AngularJS wizard
4. Package feed
5. Binary firmware images for ar71xx devices
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Outlook & future work

1. Housekeeping (JavaScript: size, old dependencies)
2. Further testing (multihoming, roaming)
3. Map & monitoring integration (data submission, tiles download)
4. End-user documentation

Contributors welcome :-)  
https://github.com/yanosz/node-config
Thanks for your time

Any questions?