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- Linux am Router

mit einem einführenden Exkurs zu
Open Source Lizenzen.

Outlook



- Open Source
 - History, Definition, Licenses
- OpenWrt
 - DHCP, NetFilter, CoovaChilli, OpenVPN
- Raspberry Pi
- Wireless Communities
 - Pico Peering Agreement

Open Source History



- 1984: GNU Project
 - GNU: **G**NU's not **U**nix
 - GNU Hurd Operating System
- 1985: Richard M. Stallman (MIT)
 - Free Software
- 1991: GNU/Linux
- 1998: Open Source Initiative (OSI)

Open Source Definition



1. Free Redistribution
2. Source Code
3. Derived Works
4. Integrity of The Author's Source Code
5. No Discrimination Against Persons or Groups
6. No Discrimination Against Fields of Endeavor
7. Distribution of License
8. License Must Not Be Specific to a Product
9. License Must Not Restrict Other Software
10. License Must Be Technology-Neutral

Open Source Licenses



- Apache License
- BSD License
- GNU General Public License (GPL)
- GNU Library or "Lesser" General Public License (LGPL)
- MIT License
- Mozilla Public License (MPL)
- X11 License

GNU General Public License



” The central idea of copyleft is that we give everyone permission to run the program, copy the program, modify the program, and distribute modified versions – but not permission to add restrictions of their own. ”

Richard M. Stallman

GPL Freedoms



- freedom to **run** software for any purpose
- freedom to **redistribute** software
 - same license applies to copied code
- freedom to **modify**
 - same license applies to modified code
 - modified code does not have to be published
- freedom to **copy, study, improve**

GPL Liabilities



- **source code** has to be provided (if requested)
- **no** licensing fee or royalty
- *"...includes any amount of gpl code in another program, that entire program becomes subject to the terms of the gpl."*
 - **viral** license

Compability of OS Licenses



| License | may be used with closed source code | modifications have to be free | may be released under new terms |
|----------------|--|--------------------------------------|--|
| GPL | - | X | - |
| LGPL | X | X | - |
| MIT | X | - | - |
| Public Domain | X | - | X |

Links



<http://opensource.org>

<http://opensource.org/osd.html>

<http://opensource.org/licenses>

<http://gnu.org>

<http://gnu.org/licenses/licenses.html>

An historic GPL violation



- 2003-06: Andrew Miklas et al. report Linksys to have violated the GPL (distribution of modified Linux-code without providing the source code)
- 2003-10: Linksys publishes the Linux kernel for the WRT54-G router.
- gpl-violations.org initiated by Harald Welte (NetFilter developer)
 - 2006-06: 100 finished cases, 100 % legal success
- 2004-01: OpenWrt



- a Linux distribution for embedded systems
- GPL
- plenty of ported (ipkg) software packages
 - dnsmasq
 - SSH
 - OSLR
 - coovachilli
 - openvpn
 - ...

Links



GPL

<http://gpl-violations.org>

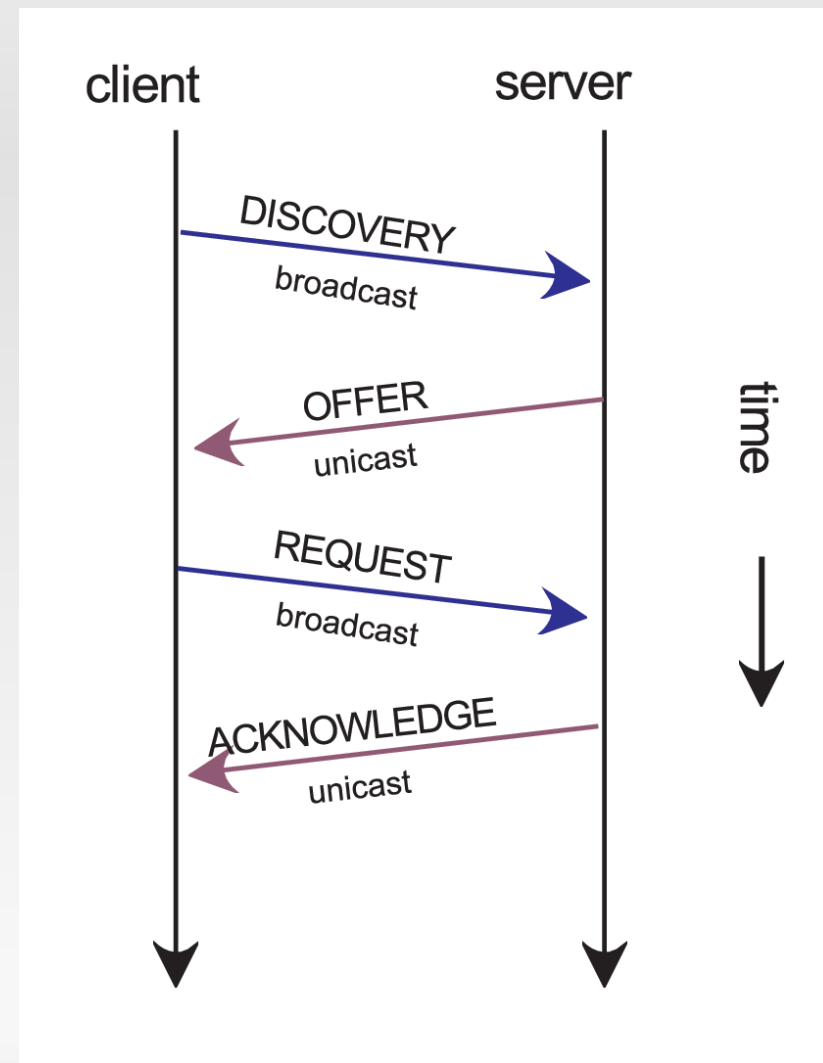
OpenWrt

<http://openwrt.org>

Dynamic Host Configuration Protocol (DHCP)



- DHCP client
 - MAC address of NIC
- UDP broadcast
- DHCP server
- automatic assignments
 - IP, netmask, gateway, etc.
- lease time



Netfilter/IPtables

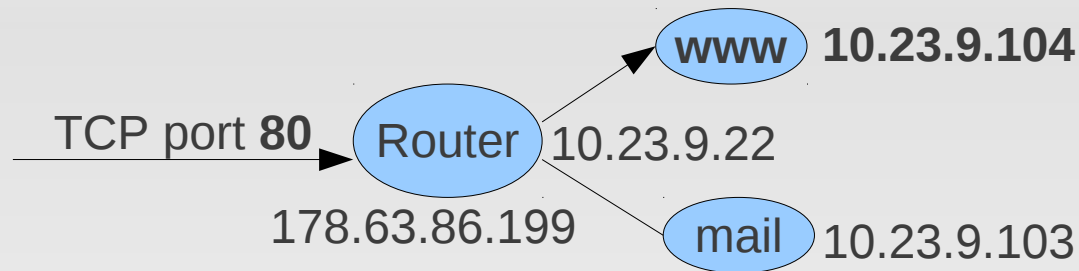


- Firewall (accept, drop, log)
- Routing (forward, DNAT, SNAT, masquerade)
- packet marking for Quality of Service
- GPL

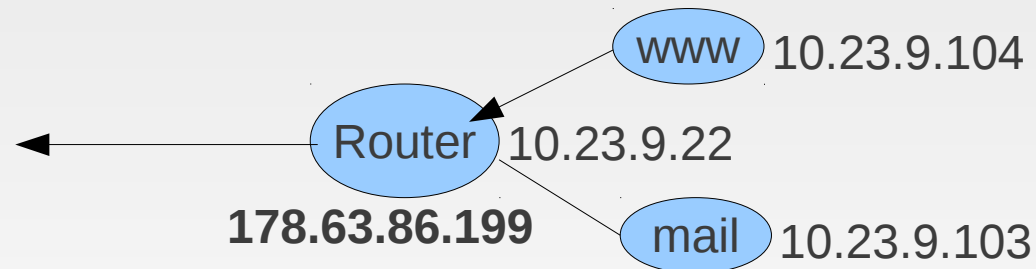
Netfilter/IPtables for routing



- Destination Network Address Translation



- Source Network Address Translation



Netfilter/IPtables



- Shell-Script, Shorewall, UFW, **Firewall-Builder**

The screenshot shows the Firewall Builder application window. The interface includes a menu bar (File, Edit, View, Insert, Rules, Tools, Help) and a sidebar on the left with a tree view of objects (Objects, Services, Firewalls, fw, eth1, eth0, lo, Policy, NAT, Time). The main area displays a table of firewall rules.

| Num | Source | Destination | Service | Action | Time | Options | Comment |
|-----|--------|-------------------|----------------------|--------|------|---------|--|
| 00 | fw | Any | DNS | Accept | Any | | firewall uses DNS server on Inet |
| 01 | Any | fw | DNS | Accept | Any | | firewall serves as DNS server for LAN |
| 02 | Any | broadcast eth0 | DHCP | Accept | Any | | firewall serves as DHCP server for LAN |
| 03 | eth0 | Any | DHCP | Accept | Any | | firewall serves as DHCP server for LAN |
| 04 | Any | hostA | TCP smtp ftp | Accept | Any | | mail and ftp server behind the firewall |
| 05 | fw | Any | ICMP ping request | Accept | Any | | |
| 06 | LAN | fw | TCP ssh | Accept | Any | | ssh access to firewall from internal LAN |
| 07 | Any | Any | Any | Deny | Any | | 'catch all' rule |

At the bottom right of the window, there are buttons for "Apply" and "Undo".



DHCP

<http://tools.ietf.org/html/rfc2131>

NetFilter/IPtables

<http://www.netfilter.org>

<http://shorewall.net>

<https://launchpad.net/ufw>

<http://www.fwbuilder.org>



- turns an access point into a hotspot
- captive portal
 - redirects HTTP requests
 - web based login
 - uses a Radius server for
 - authentication
 - authorization
 - accounting
- GPL





- establishes encrypted tunnels between hosts
- GPL

alternative to WPA, ~~WEP~~,...

- Wireless Client = OpenVPN Client
- Wireless Router = OpenVPN Server

Links

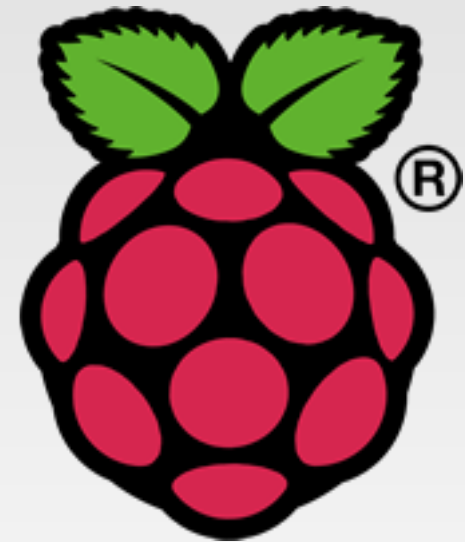


<http://coova.org/CoovaChilli>
<http://openvpn.net>

Raspberry Pi – History



- Raspberry Pi Foundation
 - propagating computer science in schools
- Raspberry Pi
 - 25 \$ (Model A)
 - 35 \$ (Model B)
- Pi Store
- Python Programming Language



Raspberry Pi, Model B rev 2



- 29 February **2012**
 - 512 MB RAM, 2xUSB, HDMI, RJ45, 3,5 mm jack, 8xGPIO
 - 5 V MicroUSB: 3,5 W
- Operating Systems:
 - Raspbian, Fedora, Arch Linux, FreeBSD, NetBSD, RISC OS, OpenELEC, raspbmc, Android (2.3, 4.0), Firefox OS, Gentoo, Slackware ARM, WebOS, ...



Raspberry Pi – Some Ideas



- Media Server: XBMC, Internet Radio
- NAS, Print Server
- Home VPN Server
- VoIP PBX: Asterisk
- Web Cam Server
- Home Automation: ZigBee
- Web, Mail, ... Server

Links



<http://raspberrypi.org>

Ad Hoc Wireless Network



- IP subnet
- MAC address
- wireless standard: WLAN 802.11
 - antenna
- mesh routing protocol:
 - Optimized Link State Routing protocol (OLSR)

Wireless Communities



- FreiFunk.net (Germany)
- FunkFeuer.at (Austria)
- La Fédération France Wireless (France)
- nycwireless.net (New York City, US)
- ilesansfil.org (Quebec, Canada)
- Wireless Africa
- ...

Pico Peering Agreement



1. Free Transit
2. Open Communication
3. No Warranty
4. Terms of Use
5. Local Amendments

” The PPA shall be implemented in data readable form following agreed standards in community network node data bases to facilitate automatic interconnection of nodes. ”



OSLR

<http://olsr.org>

<http://www.ietf.org/rfc/rfc3626.txt>

OpenWrt-Distributions

<http://freifunk.net>

<http://dd-wrt.com>

<http://openwrt.picopoint.com>

Pico Peering Agreement

<http://picopeer.net>