The Free Network Foundation

Wer bin ich?

- FNF Supporter seit 2012
- 14 Jahre Erfahrung in System/Netzwerk- und Software-Entwicklung

Geschichte der FNF

- Gegründet 2011
- Tower für Occupy Austin/Occupy Wall ST bereitgestellt
- $10k mit ContactCON Award
- $3k mit IndieGoGo
- ArsTechnica, BetaBeat, Time, CNN, Fast Compandy

Wer/Was ist die FNF?

- Wer steckt hinter der FNF?
- Wie genau wird die FNF finanziert?
- Was ist die FNF?
    - Vision
- Was macht die FNF um diese Vision zu realisieren?

Komponenten für das FreeNetwork

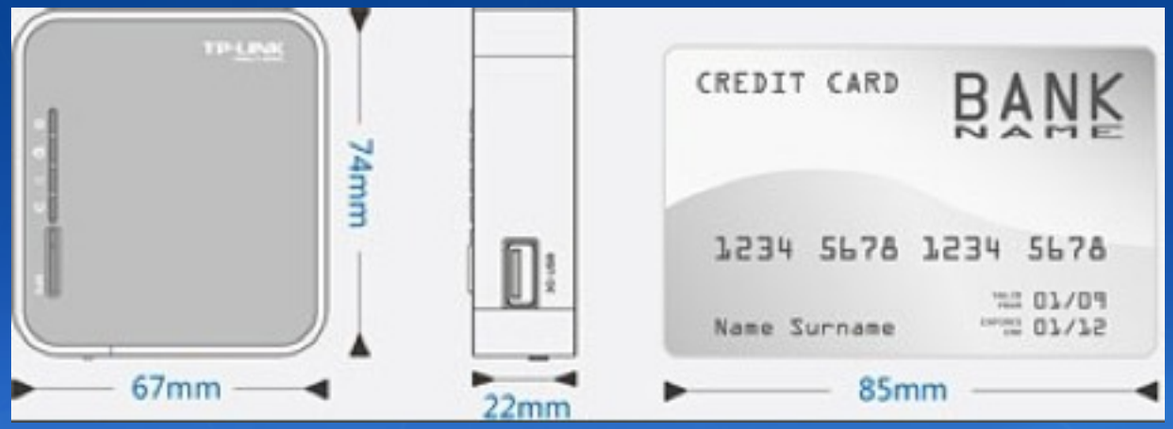
- FreedomBox/FreedomNode
- FreedomTower/FreedomTunnel
- FreedomLink/FreedomWAN

FreedomBox

- Entwickelt von der FreedomBox Foundation
- “Local cloud”

FreedomNode

- Lässt jedes Gerät am FreeNetwork partizipieren
- Niedrige Kosten (ca. 50€)
- Basiert auf OpenWRT
- Hardware im Kreditkartenformat


74mm
67mm
22mm
CREDIT CARD
BANK NAME
1234 5678 1234 5678
Name Surname
01/09
01/12
85mm


3G Router Mode
Travel Router Mode
(AP Mode)
WISP Client Router Mode
• 3G
• WISP
• AP

FreedomTower

- Lokalisierte Netzwerke
- 2500€
- Solarbetrieben
- 100€ monatl. Backhaul-Kosten
- 1,5 km Radius
- Kapazität für einige hundert Benutzer

FreedomTower

Instructions for Configuration and Assembly

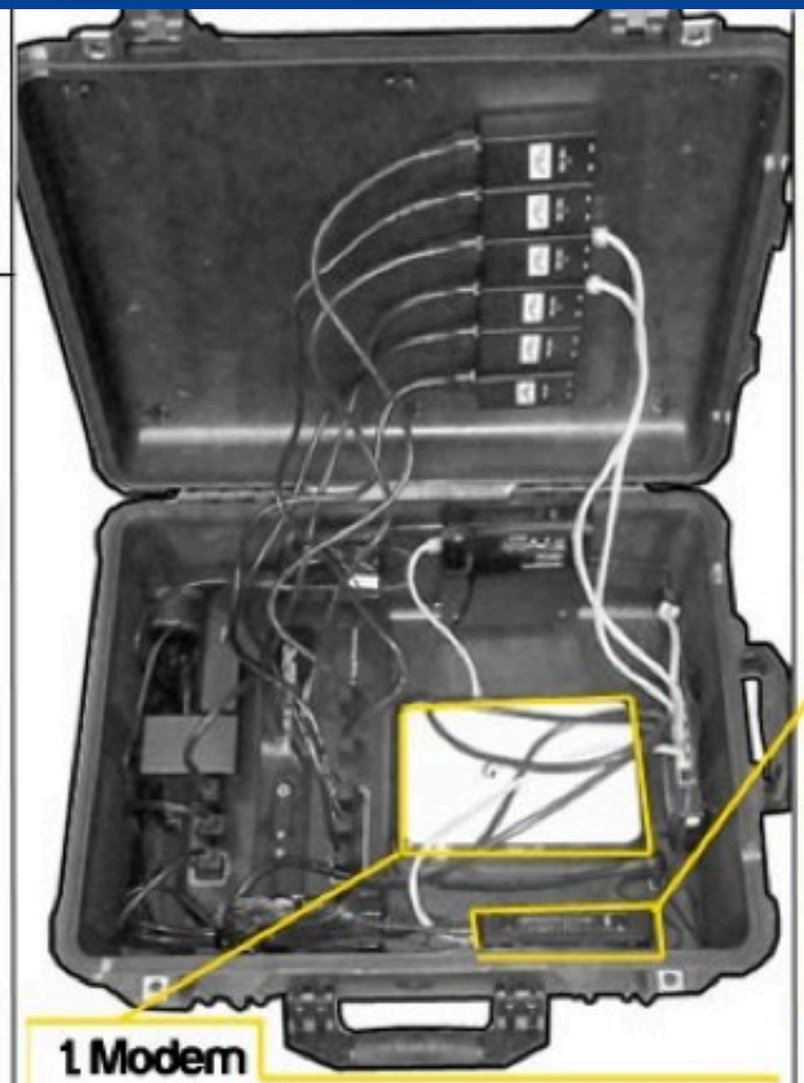
Bill of Materials:

* A quiet power generator such as the Honda EU1000i ($800)
* A UPS such as the APC BE750G ($100)
http://amzn.to/dlobOm
* A nettop such as the Lenovo IdeaCentre ($300)
http://amzn.to/qs1lUv
* An 8-port network switch ($15)
* Three USB->Ethernet adapters ($30 x3)
* Two 4G modems such as the Clear Series M ($85.00 for each modem, $45.00 for first month for each, $30.00 activation fee total ($320.00 total) [Procure from Clear store so no contract required]
* Three Ubiquiti NSM2s ($80 x3 = $240)
http://bit.ly/oUKomV
* Three Ubiquiti NSM5 Locos ($50 x3 = $150)
http://bit.ly/oEI7QF or http://bit.ly/nRk9F8
* Enclosure for UPS, computer, router, modems, and radio power injectors ($115)
http://www.leisurepro.com/Prod/PL1510NF.html?&&
* EMT Conduit mast (9') $12.00
* Two ten-inch sections of 2x10" board $10
* Five power splitters
* 50' red CAT5
* 25' black CAT5
* Velcro, zipties ($20)

Needed supplies:

* Drill
* 1/2" bit
* RJ45 (ethernet) Crimper
* Label maker
* 1 Hour Epoxy

The heart of the FreedomTower is a nettop computer running pfsense, a variant of openbsd, that makes it easy to do network administration. We used the Lenovo Q150 in our build, but ran into problems when we discovered that the south bridge of the Q150's chipset is not supported by openBSD. You may wish to proceed as we have, by working around the problem using USB to Ethernet adapters, or you may wish to explore alternative nettop hardware. If you do the latter, please let us know how it goes.



1 Modem

We recommend that you procure the wimax modems for your Tower through a corporate account with Clear. There is no price difference, and it will give you access to second level support, should the need arise.

To configure your machine to look for an address via DHCP on your wired interface. Plug directly into each modem in turn.

Access the web administration interface of the modem by navigating to 192.168.15.1 - the password is set by default to CLEAR123, but may still be the OEM default of motorola. Once you're in, you should change the password, and record the WAN IP address of the modem.

If you're using two or more modems it will be necessary to change the DHCP settings so that each modem has a different address. Leave one modem as 192.168.15.1, and number additional modems by iterating the third octet: 192.168.16.1, 192.168.17.1, etc.

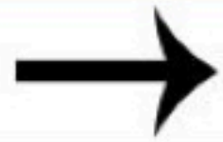
2. Server

Hook up your nettop to a monitor and keyboard. You will need a live image of pfsense. You should use the stable release of version 2. Before you proceed, connect the box to at any WAN connections, and to the network switch. Install pfsense on the box, configuring it to accept an address via DHCP on all WAN connections, and to serve addresses via DHCP to the LAN.

Once this is done, you'll want to reconfigure the LAN settings to expand the subnet. We recommend using 192.168.10.0 through 192.168.254.254. Then configure DHCP to hand out that range of addresses.

The next step is to set up load balancing against the WAN connections. This is done by creating a gateway group, and making a firewall rule to route all lan traffic to that gateway.

screenshot



The Free Network Foundation is a nonprofit organization that builds tools and advocates for communities to become their own cooperatively run, locally owned internet service providers. Learn more about how to get involved at www.freenetworkfoundation.org

3. Radios

Flash the devices with the proper firmware. You'll need to do it for all six radios. We are using a version of Ubiquiti's AirOS that's been patched to support OLSR routing. You'll also need to have TFTP installed on your machine. It is widely available via your favorite package manager. The firmware can be found here: LINK OR SHORTER URL

Once you've got the firmware on your machine, you'll need to put it on the radios. First, you'll configure your machine to have a static address is in the 192.168.1.x subnet. Any address besides 192.168.1.20 will work. Next, take an unpowered radio, and depress the reset button. Continue to hold the reset button, and plug the radio in. Continue holding the reset button until the lights on the radio flash 1-3, 2-4, 1-3, 2-4. Release the reset button.

The radio is now in TFTP flash mode. You'll want to ping 192.168.1.20 to make sure that you've got a connection to the radio. Navigate to the directory where you've stored the firmware binary, and flash it to the radio using the following commands, there is not tab-to-finish in TFTP, so you'll have to type everything out: LINK OR SHORT URL

When the transfer has finished, you can quit TFTP and reboot. Once back online, navigate to 192.168.1.20 in your browser. You should be presented with the ubiquiti web interface. The default username and password are ubntubnt. We recommend changing the admin user name, and the hostname. Our radios are named FNF2-0, FNF2-1, FNF2-2, and FNF5-0, FNF5-1, and FNF5-2.

Once you've changed these settings, you should also ssh into the machine in order to change the password, using the command passwd.

All radios should be set to bridge mode, and configured to obtain an address via DHCP. The 2-0 and 5-0 radios will be configured as access points, and the 2-1, 2-2, 5-1, and 5-2 radios will be configured as stations. You should also make sure that all radios are set to a 20MHz channell width, and have AirMax turned off.

On the 2-0 and 5-0 machines, you'll set SSIDs for the networks. Ours are called "The Free Network" and "The Free Network 5GHz". Once you've set the SSIDs on the Access Points, you'll lock the station radios to the MAC address of their respective APs.

Label the radios with
Role (mesh node 5/24ghz node (x), mesh node 5/24ghz gateway)
WLAN IP
LAN IP

4. Assembly

Step One: Enclosure
In order to keep the power supply stable, it will be necessary to fill the bottom gap (between the wheel wells of the case) with the boards. Epoxy the two boards together. Then expoxy the boards to the bottom of the case, being careful to keep the boards flush with the bottom. Once cured, attach the power supply on top using a couple strips of Velcro.

Be careful to affix the velcro such that the battery compartment of the UPS can open. The power supply cord exits at the bottom right corner of the case. The case can't shut with a power cord inbetween the base and the lid, so use a knife to carve away the closure lip, without cutting through the weather seal. You should be able to close the case around the power cord, and maintain a water-tight closure.

Next, you'll mount the modems, one (or more) on either side of the case. Use velcro. Be generous. Mount the nettop in the same way. We mounted ours so that the fan vent is up, which puts the power button against the back wall of the case. This helps avoid accidental power cycles.

Velcro the switch, but this time, mount it to the top of the case. Depending on what model of switch you have, you may want to remove the rubber feet before applying the velcro, as the feet tend to slip out of their fittings.
Next task is to mount the power over ethernet injectors for the radios to the lid. The ports should face the top.

Now you're ready to plug the five power splitters into the five outlets labelled 'sure protections and battery backup'. This is so that the entire rig can run off of batteries. We use the three splitters on the left for the power injectors, and the two on the right for the modems, router, and switch.

Step Two: Mast
Drill two holes 1ft and 2ft down from the top of the mast. The top hole will be for the ethernet cables going to the NSM2s, and the bottom will be for the NSM5Ls.

5 inches from the bottom, drill two 1/2" holes in a horoizonal line. Now run 1' sections of uncrimped ethernet cable through the mast. Cables that enter through the same hole should exit through the same hole.

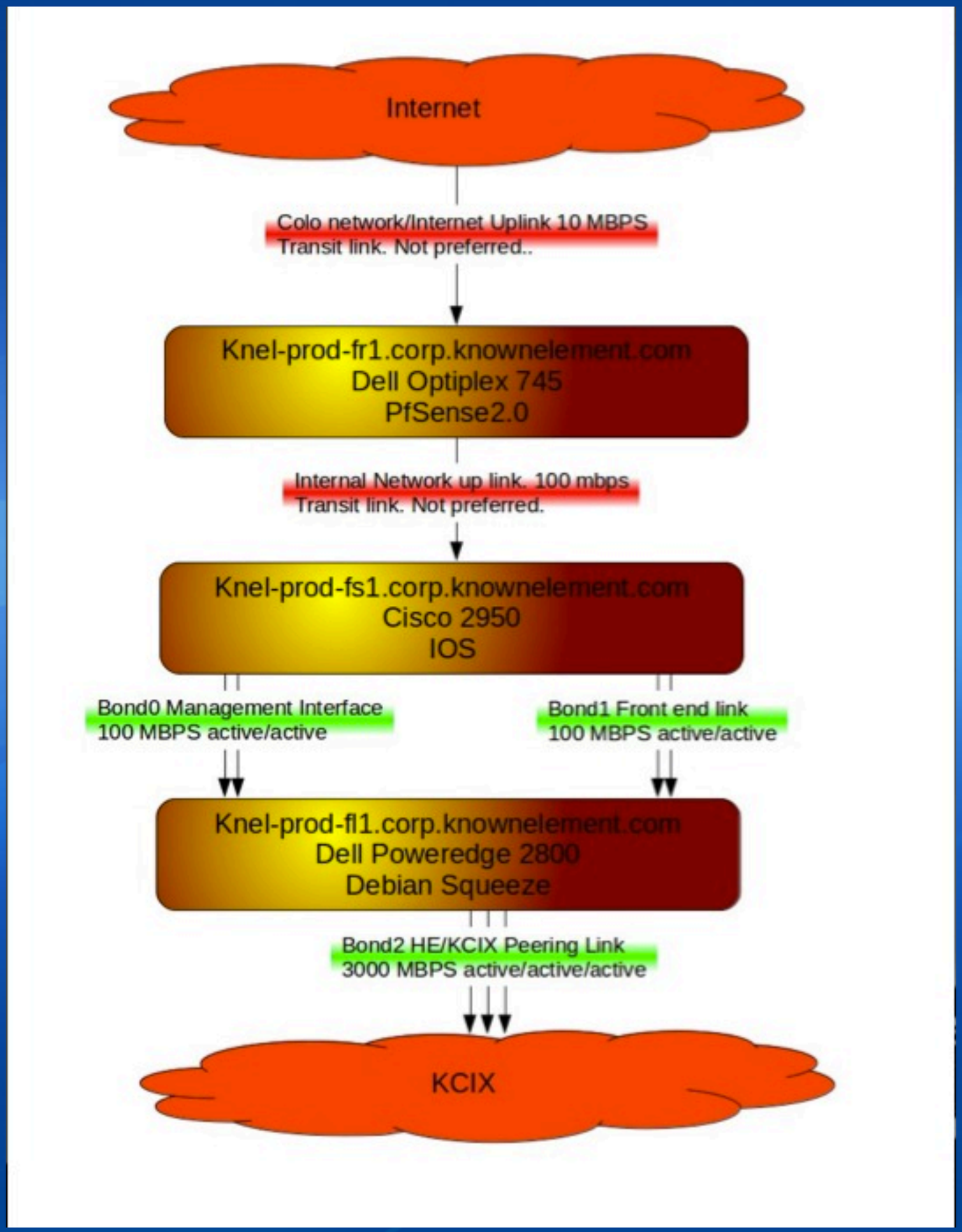
Use two red cables and one black per hole. The black cable will carry power and data. The red cables will cary only power. You might use string, and a bent wire hanger to make the process go quicker. Once the cables are through, crimp both ends.

Ziplie the radios to the mast, and plug in the cables. Mount the mast on the tripod, and run the cables down around the tripod. You'll need to do the same for the two ethernet bundles as you did for the power cord.

Plug everything in, and you've got yourself a FreedomTower!

FreedomTunnel

- Overlay Network
- Einmalanmeldung (Single Sign-On)
- Einmalpasswörter (One-Time-Passwords)


Internet
Colo network/Internet Uplink 10 MBPS
Transit link. Not preferred..
Knel-prod-fr1.corp.knownelement.com
Dell Optiplex 745
PfSense2.0
Internal Network up link. 100 mbps
Transit link. Not preferred.
Knel-prod-fs1.corp.knownelement.com
Cisco 2950
IOS
Bond0 Management Interface
100 MBPS active/active
Bond1 Front end link
100 MBPS active/active
Knel-prod-fl1.corp.knownelement.com
Dell Poweredge 2800
Debian Squeeze
Bond2 HE/KCIX Peering Link
3000 MBPS active/active/active
KCIX

FreedomLink

- Basiert auf PfSense
- BGP/Babel routing protocols
- 2500€

FreedomWAN

- Fiber/Satellite ist einfach nicht cool genug

FreedomNOC

- Globales NOC
- Ticketing (End user support, circuit turn up etc)
- Monitoring (Towers und Links; NIEMALS Netzwerkverkehr)
- Sicherheit (Anti virus/Spam)
- Backups
- IP Management
- Asset Tracking
- GIS

FNF der Film

Wie kann ich als Techniker helfen?

- Besuche http://chili.freenetworkfoundation.org und erstelle ein Benutzerkonto
- Stell dich uns vor: builders@freenetworkfoundation.org

Wie kann ich als Betreiber helfen?

- Community Meetings
- Anleitungen für FreedomTower

Wie kann ich als Benutzer helfen?

- Spread the word

Wieviel wird das kosten?

- Eine Milliarde Euro?
- 5 Städte, 1 Jahr, 150k EUR
- Spenden an freenetworkfoundation.org