

*How will your local  
community communicate  
when a disaster hits?*



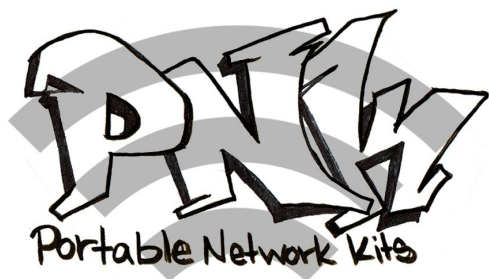
# Portable Network Bits

**A GUIDE TO MAKING YOUR OWN  
MINI LOCAL WIFI NETWORK!**



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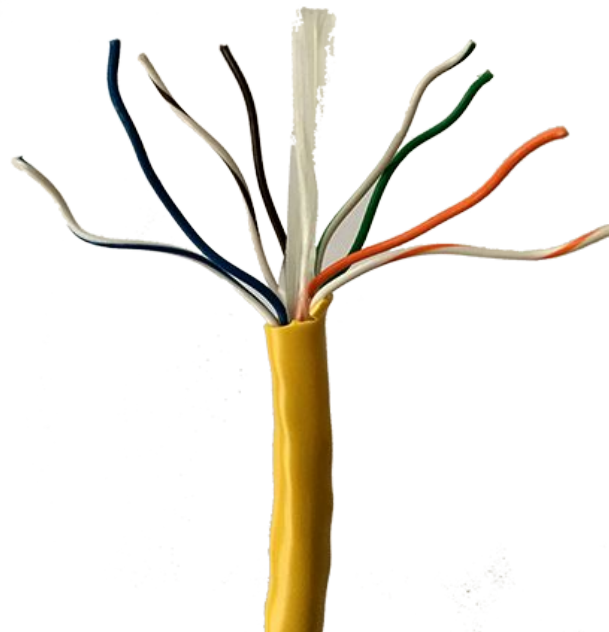
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## Special Thanks

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## Resilient Communities

Resilient Communities works alongside local groups and leaders to design, build, manage, and leverage community wireless networks as platforms to strengthen relationships and address risks and challenges. In particular, we partner with vulnerable communities already feeling the impact of climate change.

We work to integrate these digital resources into cities and neighborhoods in ways that support community health, rather than displacing residents or weakening existing local relationships, institutions, and networks of support. In addition to increasing preparedness, our partner communities can use local wireless networks to create entrepreneurship, media, and arts opportunities; platforms for local businesses to share and coordinate services; systems for local data collection and management; and tools for local leaders to organize, connect, and compile and share information.

Resilient Communities follows the principles of the Detroit Digital Justice Coalition: Access, Participation, Common Ownership, and Healthy Communities. We design networks to fit human relationships, not the other way around.

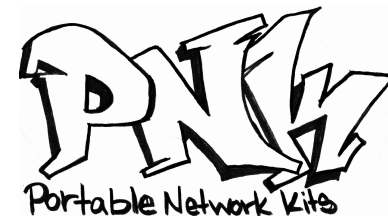
## PNK (Portable Network Kits)

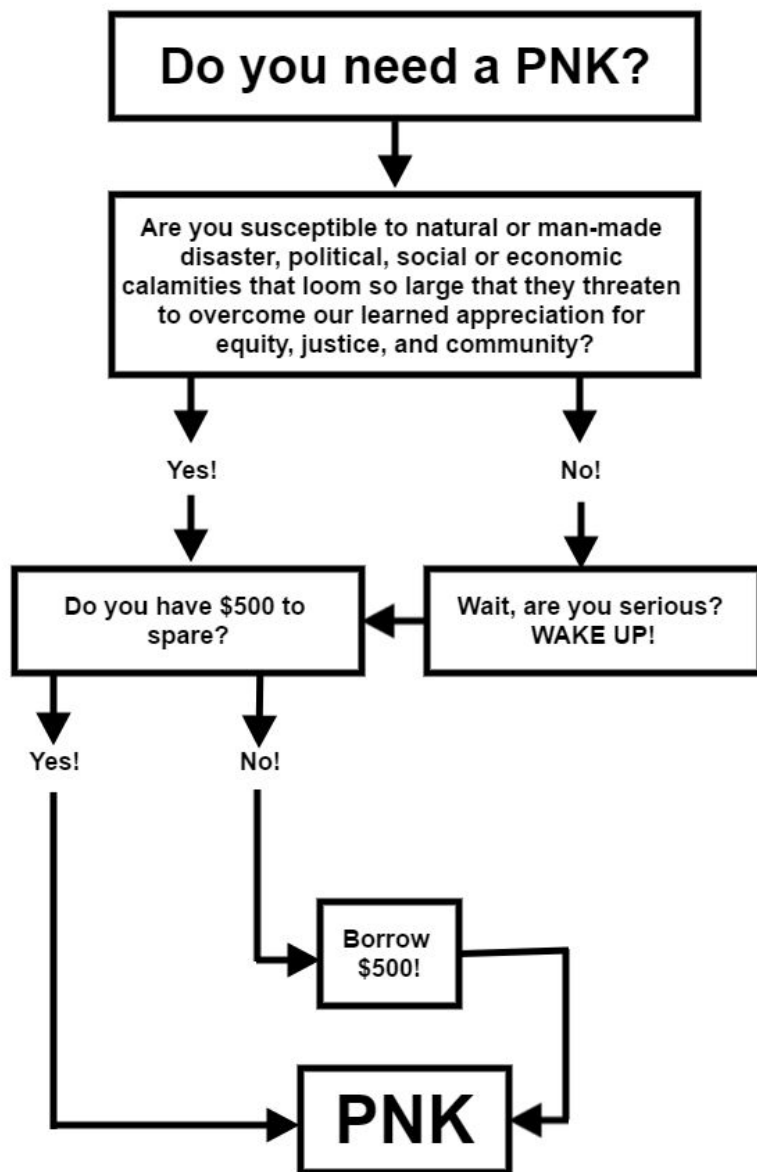
The Resilient Communities team has been working on portable network kits, or what we call PNKs. You may be wondering what is a PNK? Well, a PNK is a quick fast solution for communities or groups of people who are in the middle of any kind of disaster. It will allow people in the area to have access to the internet or even just a local network running without going out to the internet, so people can still communicate with one another even if bigger networks fail.

We as a team thought it would be a great addition to the networks we are helping build in 6 different communities throughout NYC. This can be an alternative and lighter way to give people in communities access to talk to one another, during any kind of disaster.

The Resilient Communities team wants to share this knowledge and how-to, with as many people as possible. Throughout the zine, you will see that we have provided you with everything you need to know on how to set up your own PNK! We have also included a case study from Kate Coyer, who did her own version in Budapest, just so you have an idea of what other situations you can do this in and its many configurations

We hope this zine is useful to you and to your communities and we hope you pass this along to others and start building your own wireless networks!





These methods worked in the city center, but not at some border crossings that lacked 3G mobile service or access to easily recharge battery packs. Though this was not the most sustainable or open source way to go, we were able to help people get online and charge phones immediately, which was our goal. I believe a robust solar power and meshpoint WiFi is the way to go for the long term. But for a grassroots, spontaneous response funded in 24 hours via existing social media networks, it allowed us to be quick and flexible to provide support in the city and at some of the border zones.

Communication access is crucial for refugees to stay connected with family and friends; to share up-to-date information about the chaotic transit zones and constantly changing procedures and routes; to have access to GPS, currency calculators and translation apps; and to document their own harrowing journeys. The lack of reliable information on the ground was at times shocking. In Hungary, the government actually tricked a group into boarding a train marked for the Austrian border that instead stopped at a refugee camp in the countryside unbeknownst to those on board. People with phones were able to alert others and word of the deceit spread quickly.

No single app or phone can give refugees what they most need- a safe place to live and safe passage there. But if technology can play a role in making these journeys even a bit less precarious, they're worth investing in.

<http://keleti-connected.tumblr.com/>



# A Case Study

## FREE\_WIFI-PLEASE\_NO\_YOUTUBE

by Kate Coyer, Central European University, Budapest

In fall 2015, tens of thousands of refugees fleeing war and uncertainty in their home countries made their way through Hungary trying to reach Germany and other places west.

Many refugees had smartphones, carried amongst their sparse possessions, but lacked internet access and power to charge them.

Like so many in Budapest, I was moved by the humanity unfolding six blocks from my apartment as refugees were for a time trapped at the railway station on order of the Hungarian government- not allowed to leave but not welcome to stay. Hundreds of local volunteers brought food and blankets; I gathered some friends to see what we could do to support communication access.

We needed an out of the box solution to help people get online that same day. So we went to the mall and bought 3G mobile hotspots. They're small and easy to set up. We loaded them with data-only SIM cards from a local mobile operator, put them in our pockets, and became walking hot spots providing a free, open WiFi.

The best advice was from a friend who suggested we name the network: FREE WIFI- PLEASE NO YOU TUBE. It was a straightforward way to convey a complicated message about sharing a limited commons.

Providing internet access turned out to be easier than supplying power for phone charging. First, we bought power strips to add capacity to the few existing power outlets. Then we bought portable USB battery packs. It was important we also supplied cables for charging since many people had only their phones. Someone donated a solar powered USB pack that worked well under direct sunlight.

## What's in a PNK?!

- **TP-Link Wireless Router (Access Point)**
  - \$25-\$80
- **Battery Pack(s)**
  - \$80-\$100
- **Raspberry Pi (Local Server)**
  - \$30-\$40
- **Ethernet Cable (bulk)**
  - \$60-\$100 (*depends on footage*)
- **RJ45 Ethernet Cable Connectors**
  - \$8-\$10
- **RJ45 Crimper**
  - \$60-\$80
- **RJ45 Cable Tester**
  - \$15-\$40
- **Safety Goggles (*very stylish*)**
  - \$2-\$20
- **Laptop**
  - \$150-\$400
- **Zip Ties**
  - \$5-\$15
- **Wire Clippers**
  - \$5-\$20
- **Headlamp**
  - \$10-\$20
- **Backpack (*very stylish*)**
  - \$20-\$40
- **Paperclip**
  - *Borrow one!*

**NPNK Orbitron 3000**



(optional)

# Configuring Your Router

The TP-Link TL-WR841N home routers will work for a PNK with a few configuration changes. First, either plug in via Ethernet or connect to the AP via wireless. Then browse to the router's homepage at <http://192.168.0.1>

Go to the "DHCP" menu, then "DHCP Settings", then change the following settings:

- Under "default domain", enter "amc".
- Under "Primary DNS", change 0.0.0.0 to 192.168.0.10

Save the DHCP configuration and reboot the router under "System Tools -> Reboot".

Log back into the device, and change the Access Point information. Go to the "Wireless" menu, then "Wireless Settings". Update the "Wireless Network Name" to something that makes sense for your session. Save, then re-connect to the new Access Point name.

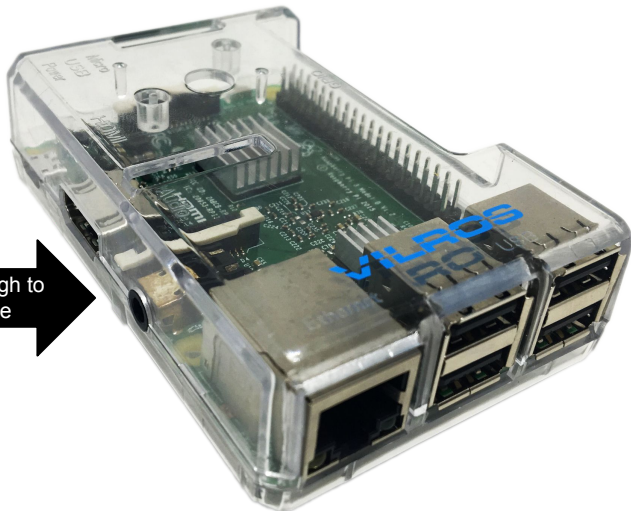
# PNK Tips!

- Be sure to have your battery pack(s) charged!
- Extra battery packs can be used for charging mobile devices in a pinch!
- It's a good idea to have a few ethernet cables pre-made!
- A weatherproof backpack is recommended!
- Be sure to pack a paperclip in case you need to reset your router!
- Pack a spare 9-volt battery for the cable tester just in case
- Be sure to have your router pre-configured before you deploy your PNK!
- Be sure to have a printed copy of all your PNK settings!



These two web applications can be extremely helpful for collecting and displaying information in a disaster. For example, neighborhood residents can create Etherpad documents with the supplies they have, and what they might need. Once these lists are compiled by neighborhood organizers, they can then create Wordpress documents that allow other residents to find the information they need quickly.

Detailed instructions on how to setup a Raspberry Pi local server can be found here: <https://www.newamerica.org/resilient-communities/resilient-futures/resilient-communities-presents-pnks/>, along with a list of the hardware you will need, down to the commands you need to run!



### *Configuring Your Router (continued)*

Go back to the “Wireless Menu”, then “Wireless Security”. For the simplest configuration, click “Disable Security”, then scroll down and Save the configuration. You may need to reconnect to the Access Point again, since the information has changed.

The vital login and password details for the routers should be:

**Username:** admin

**Password:** pnkgetsthegoods





# Crimping Ethernet Cables

Sure, you can buy Ethernet cables from the store, but where's the fun in that? If you want to make custom cable lengths or crossover cables, or repair a broken connector, why not do it yourself? Here's how.

Before you get started, make sure you have the necessary tools, and decide whether you're going to use **Cat6 network cables**.

What you'll need:

- Unshielded twisted pair (UTP) patch cable
- Modular connector (8P8C plug, aka RJ45)
- Crimping tool
- Cable tester

There are four pairs of wires in an Ethernet cable, and an Ethernet connector (8P8C) has eight pin slots. Each pin is identified by a number, starting from left to right, with the clip facing **away** from you. For reference, the T568B RJ45 connector color coding is below:

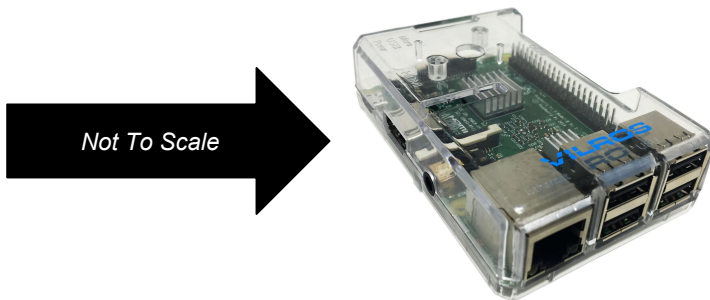
| PIN | COLOR        | PIN | COLOR        |
|-----|--------------|-----|--------------|
| 1   | Orange Trace | 1   | Orange Trace |
| 2   | Orange       | 2   | Orange       |
| 3   | Green Trace  | 3   | Green Trace  |
| 4   | Blue         | 4   | Blue         |
| 5   | Blue Trace   | 5   | Blue Trace   |
| 6   | Green        | 6   | Green        |
| 7   | Brown Trace  | 7   | Brown Trace  |
| 8   | Brown        | 8   | Brown        |

The PNKs use a Raspberry Pi Model 3, with the web applications WordPress and Etherpad pre-installed on them. What are these web applications?

- WordPress is a website creation tool. It acts as a “content management system” - a platform that can host text, images, audio, and more in a database. It also has an editor built-in, which allows you to write articles, blogs, or any type of content and weave in the images and audio that you have uploaded to the system. It runs many of the popular “blog” websites out there, and can be heavily modified and themed to look like whatever you want.
- Etherpad is a web browser based real-time editor, which allows users to simultaneously and collaboratively edit a text document. If multiple people are typing in a “pad”, they can all see each other’s edits in real-time, with the ability to display each author's text in their own color. It has a built-in chat function, and can be customized as well.



Where would the information or websites come from? If the router doesn't have a connection to the Internet - neighborhood residents will see a lot of "404 - Page not found" errors and get frustrated! The answer is to use equally small, portable computers as local servers. For the Portable Network Kit, we are using a Raspberry Pi.



A "Raspberry Pi" is a credit-card-sized computer that plugs into a TV and a keyboard, but it can run without these things as well. It can be used in electronics projects, as it has generic inputs and outputs, and for many of the things that a desktop PC does, like spreadsheets, word processing, browsing the internet, and playing games. In addition, it can be used as a server - since it runs the Linux operating system, the same as on most of the "big" servers on the Internet that host your favorite websites.

## 8 Step Guide to Making your Own Cable!

**Step 1:** Strip the cable jacket about 1.5 inch down from the end.

**Step 2:** Spread the four pairs of twisted wire apart. For Cat5e, you can use the pull string to strip the jacket farther down if you need to, then cut the pull string. Cat 6 cables have a spine that will also need to be cut.

**Step 3:** Untwist the wire pairs and neatly align them in the T568B orientation. Be sure not to untwist them any farther down the cable than where the jacket begins; we want to leave as much of the cable twisted as possible.

**Step 4:** Make sure the wires are as straight as possible, ( easy tip: use the piece of the jacket you cut out off earlier to help you). Then once that is done, cut about 0.5 inch of the wires right above the end of the jacket.

**Step 5:** Carefully insert the wires all the way into the modular connector, making sure that each wire passes through the appropriate guides inside the connector. All wires must touch the top of the connector.

**Step 6:** Push the connector inside the crimping tool and squeeze the crimper all the way down.

**Step 7:** Repeat steps 1-6 for the other end of the cable.

**Step 8:** To make sure you've successfully terminated each end of the cable, use a cable tester to test each pin. If each number on the tester on each side light up green then CONGRATS! Your wire works. If not try again and don't be discouraged.

## Using a local server in your PNK!

Most of the web sites you visit on a daily basis are accessed over the Internet. News and information sites, social networks, image sharing sites, and so on. Most of the applications you use on your mobile device pull the data from the Internet. Generally, these are called “network applications” – everything is stored on a computer somewhere on a network, usually far away from wherever you are!

As an example - when you check your email in a web browser, that “webmail” application is a network application which retrieves information about the emails in your inbox from another computer. That computer is acting as a server, and is responsible for “serving” information to your personal device or computer. A web server is simply a server that provides information needed to display a website, while an email server is a server that sends and receives email information. The web browser or mobile application that requests information from a server is referred to as a “client”.

In the case of a disaster or other emergency, connections to the Internet may be damaged or overloaded, and fail. This would prevent you from accessing any websites or information on the Internet - or communicate with your family, friends, or neighbors to ask for help. How could you collect information or communicate with your neighbors in such a scenario?

A local network can serve as a “micro-Internet” in some of these scenarios. These could be a set of wired or wireless network routers that distribute a signal around, and allow nearby neighborhood residents to connect their mobile devices to the network, and access whatever information or communication tools are available. The Portable Network Kits are an example of this! The wireless routers in the kits are a very small, portable example of this. They are easily battery powered, but don’t have much range - these specific routers are intended to be used for small sites where people may need to access information - such as an office or home.



## Your Raspberry Settings

Hostname: \_\_\_\_\_

Username: \_\_\_\_\_

Password: \_\_\_\_\_

IP Address: \_\_\_\_ . \_\_\_\_ . \_\_\_\_ . \_\_\_\_

## Your Apps Settings

App: \_\_\_\_\_

Username: \_\_\_\_\_

Password: \_\_\_\_\_

App: \_\_\_\_\_

Username: \_\_\_\_\_

Password: \_\_\_\_\_

Database Name: \_\_\_\_\_

Username: \_\_\_\_\_

Password: \_\_\_\_\_

## Your Router Settings

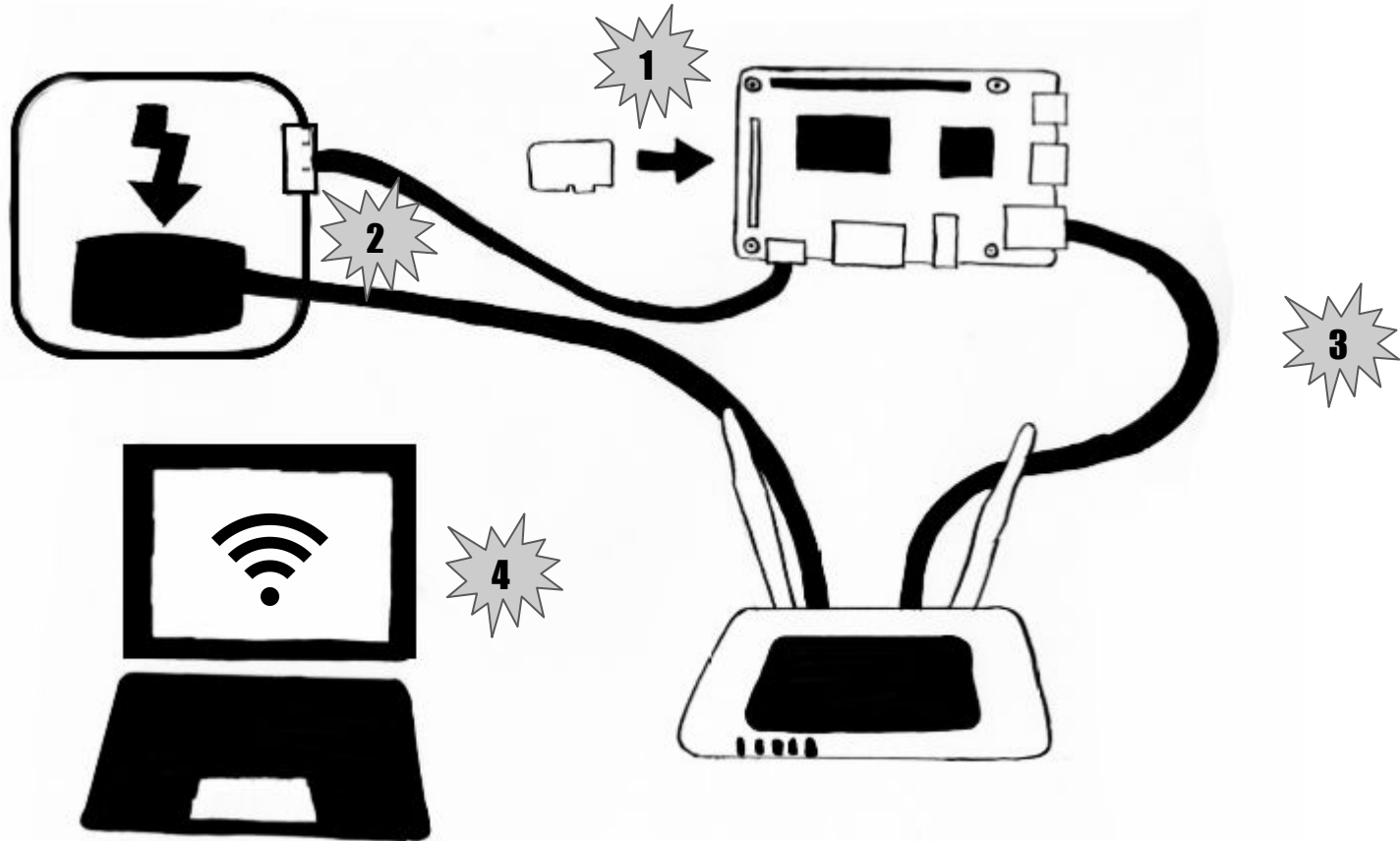
SSID: \_\_\_\_\_

Admin: \_\_\_\_\_

Password: \_\_\_\_\_

Notes:

# OH LOOK! A HANDY DANDY PNK SET UP GUIDE!



1. Insert the MicroSD card into the slot at the end of the Pi.
2. Plug the router's power adapter and the Pi's MicroUSB connector into the battery pack
3. Plug an Ethernet cable from your router to your Pi.
4. Connect your phone, computer, or tablet to the router via WiFi