How will your community communicate when a disaster hits?
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PNK (Portable Network Kit)  
Stand-Alone Communications Platform

A Portable Network Kit (PNK) is a collection of off-the-shelf consumer hardware you can put together to make your own battery-powered local WiFi network.

PNKs are easy to assemble and use. It’s harder to configure the software, but community technologists can learn how and train others using the instructions.

If you are starting from scratch and have internet access, visit: pnkgo.com/how-to/

All the instructions are there to download the files to create your Raspberry Pi server on a microSD card and configure your EdgeRouter X or MikroTik Router, and from there to assemble and start using your PNK!
FAQ PNK

Is it easy to use?!
You can see and connect to a PNK from your phone or computer, just like any other WiFi network. If the network has an internet connection you can go online and do whatever it is you do online. If there is no internet connection you can connect to the local server inside the PNK.

What is the range?!
The PNK connects devices in a small area – anywhere from one building or public square to about a half square mile if you add or “mesh” additional WiFi devices to create a wider range. If you add additional kits, you can mesh them together to create an even wider range.

How much does it cost?!
The most basic version of a PNK costs around $500 for the WiFi gear and a rechargeable battery pack. A more versatile kit to provide connectivity and resilient features in an emergency can cost up to $2000 including large solar panels and high capacity battery packs. Also, as you add routers and access points to expand the PNK range, the price goes up, and each additional router/access point requires a power source (small battery pack).
Mode 1 - Network Extension

- This mode will simply extend the reach of a community WiFi network to allow access to the global internet and the local community servers.
- Think of it as a network repeater that can be placed anywhere Line-of-Sight (LoS) to other network antennas and AC power are available.
- It is assumed you have already paired the wireless Point-to-Point (PtP) connection and adopted the Mesh Access Point (AP) to your community WiFi network as well as secured a safe location to mount the antennas.
- It is configured to run on AC power (but, in a pinch, can also be powered via DC battery power).

How-To

- Open the case
- Plug in the AC cable to a wall socket
- Turn it on within range of another mesh antenna and it automatically joins the mesh network
- Prepare your WiFi device to join a WiFi network
- Join the network and open a browser window to access the internet or local community apps & services

(Note: If you are out of range but have LoS to a rooftop node, you can use the preconfigured PtP antenna to pair with a network rooftop PtP antenna to provide internet access as well as local apps & services)

Basic PNK = $502.83 for all gear

<table>
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<th>Item</th>
<th>Quantity</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Splitter Adapter 12Volt</td>
<td>1</td>
<td>$10.99</td>
</tr>
<tr>
<td>10 pack, Ethernet Cables</td>
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<td>Unifi AC Mesh</td>
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</table>
> Mode 2 - Independant Emergency Network

- This mode will create a pop-up / ad hoc local WiFi network that can mesh with other PNKs
- This mode utilizes a Ubiquiti EdgeRouter X to create a local network, hand-out IP addresses, and manage traffic. It also uses a Raspberry Pi as a server to provide local apps and services (chat, file-sharing, shared text doc, blog). It is configured to run on DC/Battery power. Battery can be charged via solar panels
- In this mode, you CAN’T access cloud-based services like Google, Facebook, Gmail, or Whatsapp unless you provide the network with an internet connection

How-To
- Open the case
- Turn on the battery (12V button and USB button)
- Connect the mesh antenna, Wait until it turns blue
- Prepare your WiFi device to join the network PNK-WiFi
- Join the network and open a browser window to access local apps & services at http://pnkserver
- Adopt other reconfigured PNKs to the network if needed
DIY WiFi for Response, Recovery, and Resilience

In five NYC neighborhoods, The Resilient Communities team is working with local partners to build community-owned mesh networks. These telecommunications networks are designed to withstand shocks and stresses and provide community-maintained, cooperatively owned critical infrastructure in flood-prone areas.

Designing, seeding, and building mesh networks take time and effort. Our community partners—Fifth Avenue Committee (Gowanus), the Kings Bay Y (Sheepshead Bay), The Point (Hunts Point), the Rockaway Development and Revitalization Corporation or RDRC (Far Rockaway), and Silicon Harlem (East Harlem)—spent more than a year and a half pounding the pavement to get local businesses on board to participate in hosting the networks.

They've also spent the last two years training local residents to build and maintain the networks, and planning for how to support and fund the project in the long term. Meanwhile, each local partner has been training Digital Stewards—local residents knowledgeable about technology and skilled at organizing—to design and maintain the networks for the long term and in emergencies.

And finally, WordPress—a powerful website publishing platform. If your PNK is running locally, you can still access this page like a normal website. You can create blog posts, edit this post, or upload pictures and other files. Log in with the username “admin”, and password “wordpress-admin”, without the quotes.

These kits are not a gadget or a device that you can buy in a store. They’re a collection of easily configured, solar-powered WiFi gear that allows you to create a network—either standalone, or the first module of a larger community network. There are some basic elements in each kit, but kits are also customizable for different needs. All of the elements can be easily found and purchased through online retailers.

Hack.chat is a minimal web-based chat platform. You can create multiple chat rooms as needed, by entering the URL http://pnkserver:8081/?yourchatroomname. Here are two example chatrooms: PNK-general, and PNK-tech.

The UniFi Controller allows your network administrator to manage your local network. Using the controller, your admin can connect your Raspberry Pi to a switch, then connect Ubiquiti UniFi Access Points and manage a wireless network. A basic configuration is already enabled. Log in with the username “admin” and password “unifi-admin”, without the quotes. You may see a security warning the first time you browse to the controller. It is safe to proceed.

And finally, WordPress—a powerful website publishing platform. If your PNK is running locally, you can still access this page like a normal website. You can create blog posts, edit this post, or upload pictures and other files. Log in with the username “admin”, and password “wordpress-admin”, without the quotes.

Etherpad being used to organize and prepare.
**Community Technology**

Portable Network Kits are an open, flexible community technology. A community tech approach follows the principles of access, participation, common ownership and sustainability.

To create community power and the ability to support mutual aid following a disaster or emergency, the PNK team has been holding training workshops for about a year, in order to help people living in vulnerable situations or areas supply their own communications and preparedness needs.

We hope that PNK will also help people understand the principles of wireless communication, and understand how easy it is to build their own simple WiFi networks using inexpensive consumer hardware.

Finally, we hope that PNK can help people re-evaluate the need for access to monopoly internet platforms to supply basic communications needs. For example: is there really a reason that we need to pay money to global or national corporations to get food delivered, or share rides, or organize a potluck in our own neighborhoods?

We hope that people will experiment and enjoy the power that comes with building and owning their own cooperative communications platform — in emergencies, to build relationships with neighbors and allies, or just for fun and the joy of learning something new.

**Portable Network Kit**

Stand-alone communications platform

Welcome to the Portable Network Kit. This kit is running on a tiny computer called a Raspberry Pi. The Pi is running software that allows you to use shared tools, services, and content with other people using this PNK, even if you are not connected to the Internet.

**Etherpad** is a real-time collaborative text editor (basically a shared document that several people can edit at the same time). Once you create a pad, you can access it again with the URL http://pnkserver:9001/p/name-of-your-pad. Here is an example pad: http://pnkserver:9001/p/PNK-test-pad

**Surfer** allows you to upload and download documents to the Raspberry Pi using your browser. It is a simple file server with a web interface to manage files. Log in with the username “Surfer”, and password “surfer”, without the quotes.
As a grand finale for the day, we try a real deployment - making one large network from the otherwise independent PNKs. Having configured all neighborhood PNKs to work as access points for one central host PNK, teams spread out among the trees and abandoned porches characteristic for Governors Island. The island is also known for its notoriously bad cell service, and as teams disperse the local server that we are all connected to is suddenly our only means of communication. “No wonder you brought us out here to test emergency communication” one of the Digital Stewards tells me, waving his phone in the air to find any signal but the one we have generated ourselves.

After some confusion and lessons learned regarding coordination; we all convene to talk in the HackChat application - hosted on the local server - to continue our exercises. Having established stable connections it’s time for a new challenge. “Ok team! Please move your gear farther out” Raul Enríquez types in the chat. The Far Rockaway crew move further down the lane on which they are set up. Team Hunts Point experiment with bringing their access point around the corner of a building. Working together, Sheephead Bay and East Harlem Stewards venture up on a hill, beyond a cluster of trees. “I have connection through the trees” one of their team members confirm in the chat. Everyone is cold, but communicating through the independent network that we have set up, and tested to its limits.

And so it is finally time to wrap up for the day and head back to the ferry. It’s been chilly, but instructive. We look forward to future drills across the neighborhoods, and thank all of you who made it out this day for your engagement, your input, and your hard work.

PNK Drill on Governors Island
by Anna Larsson

“We seem to have lost him somewhere in the pumpkin patch,” Digital Steward Derrice Wright jokes, and looks across the field spreading out in front of him and his team. It is a Sunday in late October and 23 participants from our project Resilient Networks NYC - enabled by the New York City Economic Development Corporation’s RISE program - have gathered here on Governors Island. The Far Rockaways, Hunts Point, Sheephead Bay, Gowanus, and East Harlem are all represented this day, right here in the middle of New York harbor. Despite biting temperatures and an insistent wind blowing across the island, we are here to test, train and deploy our skills as well as our networking equipment.

The temporarily lost team member is part of a group of Digital Stewards that have taken on the task to test the range of an omni-directional mesh antenna. The antenna forms part of their Portable Network Kit - a mobile kit that can serve as a pop-up wireless network. Used for training as well as a tool for independent emergency communication, we have brought a total of six PNKs to work with on the island today - one from each neighborhood as well as the Resilient Communities team. This particular team of Stewards that have taken to experiments across the fields is surprised to find how far away it is still possible to connect and upload content onto their local server.

Later on, once back in the Far Rockaways, Derrice Wright reports back on the team’s work. “After the PNK was fired up, we had three different devices walk in three different directions to test the range,” he writes in an email. “For the exercise, I had everyone walk about 30 yards in their direction to try and send a picture message in the server chat. The devices didn’t see weak signal until about 150 yards out and only one device lost connection before the 150 yard mark because it went over a hill at about 85 yards and lost its line of sight.”
And so, this day is about a broader focus on resilience. We focus on the skills, information, and troubleshooting needed to deploy the PNK’s as independent emergency networks in the event that all other means of communication fail. With the recent anniversary of Superstorm Sandy, such a scenario is not difficult to imagine.

Having found lunch among the few food trucks that still make it out to Governor’s Island in late October, the five neighborhoods represented this day regroup. What do the lessons from the tests we performed tell us about deploying PNKs as an independent emergency network, Raul Enriquez - head of tech and training within the Resilient Communities team - asks us all. What areas do you want to make sure to cover in your neighborhood? What limitations or obstacles do you need to work around in order to deploy this kind of resilient network? Teams take to mapping the pieces of the ad hoc networks that in an emergency situation can enable crucial communication and coordination of resources in their neighborhoods. “We know what areas we need to cover, we know our neighborhood” Gowanus Community Coordinator Amir Elivert tells me. But it’s good to demystify the technology in this way - to find out how we can actually use it in an emergency, he points out.

The drills of this day take place at a time when Resilient Networks NYC is moving into its installation phase. In Gowanus, the Far Rockaways and Hunt’s Point the rooftops of the small businesses that host the networks have all been inspected. Mesh networks have been designed, and stewards have been trained in the safe use of tools and ladders. Equipment has been procured, inventoried and configured. Across the boroughs, teams are ready for installations.
Your Router Settings
SSID: ____________________________
Admin: __________________________
Password: ________________________

Your Raspberry Pi Setting
Username _________________________
Password ________________

Admin Apps Settings
Unifi Controller
Username: _________________________
Password: _________________________

WordPress
Username: _________________________
Password: _________________________

User Apps Settings
App: ______________________________
Username: _________________________
Password: _________________________
NOTES:

App: ______________________________
Username: _________________________
Password: _________________________
NOTES:

App: ______________________________
Username: _________________________
Password: _________________________
NOTES: