

Creating an Ad-Hoc On-Scene Network

Because of the immense variety of hardware and network configurations, this document is not intended to provide step-by-step instructions on how to connect to, or create, an On-Scene network. In addition, it is beyond the scope of this document to train individuals to set up complex networks. Instead, it provides an overview of important concepts, suggestions for how to setup and use an ad-hoc network until a more permanent network is available, and provides some guidance on problem solving strategies in the event that no one else is available to set up a network. Since availability of team and agency provided equipment is likely unknown, it is *highly recommended* that individuals practice using the methods listed here with their own hardware. Knowing in advance what methods work for your personal equipment will improve your ability to set up a network quickly in the field.

1. Network basics and Definitions

- A **Computer Network** is a system that allows data to be transferred between devices.
- A **Gateway** is a device that connects two or more networks. In an incident setting, the gateway is typically the device that provides internet access. This may be a separate piece of equipment or be integrated into other equipment.
- A network typically consists of:
 - **Infrastructure**, which provides the mechanism for data transfer. This is typically in the form of a Router which may connect devices using WiFi or network cables. In the simplest cases, the infrastructure may be a single cable connecting two devices, or a computer-generated WiFi connection between the computer and the second device.
 - **Devices**, which may be computers or other peripherals that need to work together to support the incident. For most incidents, these are typically computers and printers, but devices, such as networked disk drives, scanners, and others may be connected as well.

2. Priorities

2.1. General Comments

- 2.1.1. When personnel first begin arriving on scene at an incident, the immediate priority is likely to be getting search teams in the field. In this situation, on-scene personnel who are using computers generally focus on generating tasks and maps to support the search efforts.
- 2.1.2. Ideally, the incident will have a person who is assigned to build and manage the network, will have any necessary equipment, and is able to do all necessary configuration, but this is not always the case. In the event that networking personnel and equipment are not available, here is a sample set of prioritized tasks assuming that a basic network (for the

purposes of this document, defined as consisting of an internet gateway, printer, 1-5 computers) is needed.

2.2. Network Assessment Process

2.2.1. Determine network requirements. Suggested requirements include:

2.2.1.1. Number of users - used to determine hardware requirements.

2.2.1.2. WiFi hotspot - to allow easy connection of new computers. Note that some hardware may only allow a limited number of connections.

2.2.1.3. Internet connection - to allow access to external data resources on the network.

2.2.1.4. Networked printer - to allow printing of physical documents for use in the search

2.2.2. Determine what infrastructure is available.

2.2.2.1. If appropriate, sufficiently secure, and you have permission to do so, use existing networks. Examples may include access to an existing WiFi network provided by a local business or government agency.

2.2.2.2. If networking equipment is available but not setup or configured,

2.2.2.3. If no network is available, and other priorities are more pressing, consider using one computer as a wireless hotspot. Printers can be connected directly to that computer, and if properly configured, other computers connected via WiFi will be able to print to them.

2.2.2.3.1. See [Windows 10 laptop as a WiFi hotspot](#)

2.2.3. Document configuration information so that others can quickly connect to the existing network as they come on-scene. See [Appendix A: Network Access Information Sheet](#)

2.2.4. When possible, designate a person to manage the network.

3. Wireless network

3.1. General Comments

3.1.1. This document assumes that the reader is able to connect a personal computer to an existing Wi-Fi network, given the correct login information. The rest of this section involves configuring other equipment for use on a network.

3.2. Printer Setup

3.2.1. An immense variety of printers are available, and it is beyond the scope of this document to discuss how to connect to all of them. The following are general strategies for getting a printer working quickly:

3.2.2. Connecting to USB-based Printers

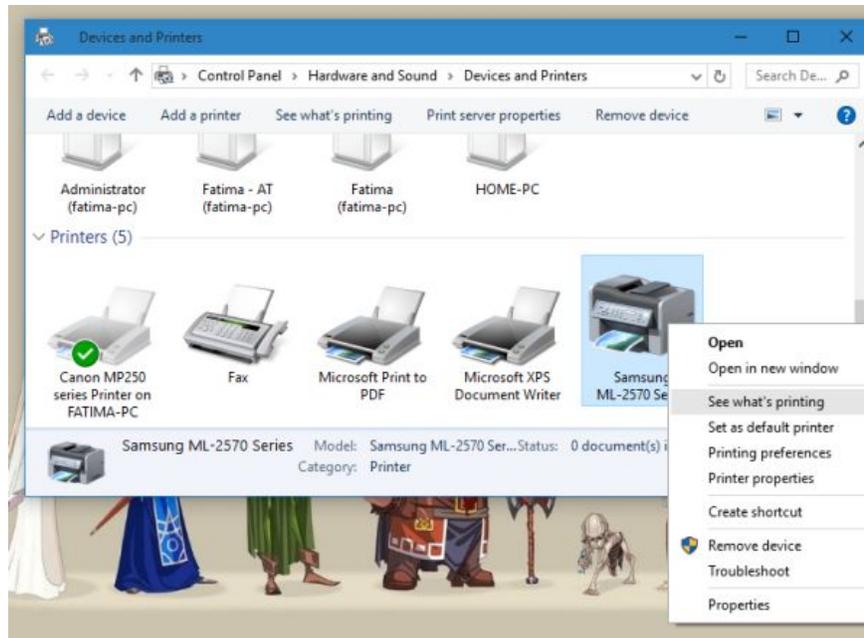
3.2.2.1. This is usually the simplest, fastest way to make a printer available to the network. The printer is connected to a networked computer using a USB cable. Most modern printers are automatically

configured by the computer to be able to print, but it may be necessary to download and install a driver, in which case an internet connection may be necessary. Once the printer is configured, it can be “shared” with the network, after which any computer on the network will be able to view and send print jobs to it. The instructions for sharing a printer can be seen below.

3.2.2.2. Sharing USB-based Printers

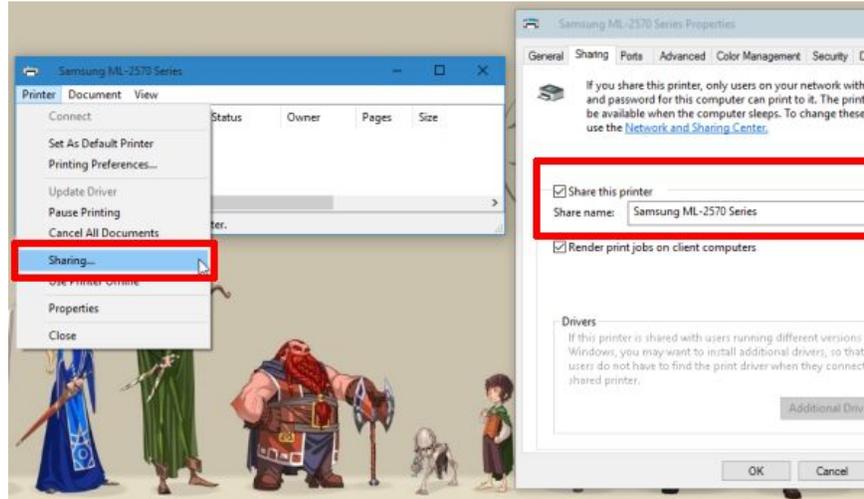
3.2.2.2.1. Windows 10¹

- 3.2.2.2.1.1. Open the Windows Settings. This may be done by opening the start menu and clicking on the **gear icon**, or by pressing **Windows+I** from any screen
- 3.2.2.2.1.2. Click on “**Printers and Scanners**”
- 3.2.2.2.1.3. Click on “**Devices and Printers**”. This will open in another window.
- 3.2.2.2.1.4. **Right click on the printer** that you wish to share, and select “**See what’s printing**” from the context menu.



¹ This section uses the method and pictures from <http://www.addictivetips.com/windows-tips/how-to-share-a-usb-printer-over-your-network-in-windows-10/>

- 3.2.2.2.1.5. Open the **Printer** menu, click sharing, then check the box next to “**Share this printer**”



- 3.2.2.2.1.6. Click **Apply**, then your printer should be visible to other computers on the same network.

3.2.2.3. iOS (Reserved for Future Use.)

3.2.3. Wireless Printer

- 3.2.3.1. More advanced printers can be configured to connect to a wireless network directly, and then are available for other computer to print to. The configuration of these printers will vary, and is beyond the scope of this document. If instructions are not available with the printer, the best way to find them is to check the manufacturer’s website.

4. Connecting using a dedicated mobile hotspot

4.1. General Notes

- 4.1.1. As with printers, an immense variety of mobile hotspots are available, and while their operation is generally straight-forward, it is beyond the scope of this document to discuss how to connect to all of them.
- 4.1.1.1. In general, once the device is powered up and the correct password is provided, any Wi-Fi enabled personal computer should be able to see and connect to the hotspot.
- 4.1.1.2. Many hotspots limit the number of connections to 5-10 devices. It is recommended that hotspots be labeled with the SSID and maximum number of connections.
- 4.1.1.3. It is important to note that the phone carrier is likely to charge for data, and downloading large files (like GIS datasets) may result in substantial charges for the hotspot’s owner.

5. Connecting to the Internet Using a Mobile Phone

5.1. General Notes

- 5.1.1. With the correct configuration, many android phones can act as both Gateway and Router, forming the core infrastructure for a small network.
- 5.1.2. It is important to note that the phone carrier is likely to charge for data, and downloading large files (like GIS datasets) may result in substantial charges for the phone's owner.
- 5.1.3. In addition, not all mobile phones have this feature - it is highly recommended that the reader verify their hardware is capable of acting as a hotspot before attempting to set up a network in the field.

5.2. USB Tethering Connection

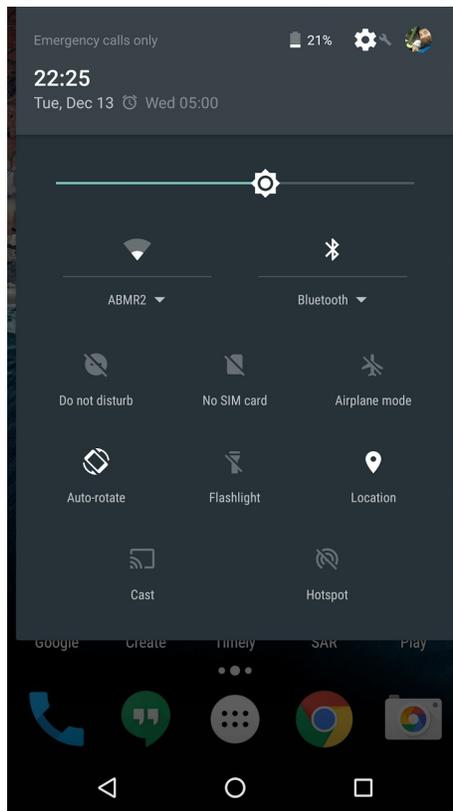
5.2.1. General Notes

- 5.2.1.1. This is arguably the simplest way to get a single computer online, and it has the benefit that the phone is kept charged by the computer.
- 5.2.1.2. It must be supported by both the phone hardware and the cellular data provider.
- 5.2.1.3. It does not create a wifi hotspot for other computers to connect to without additional configuration. (See Section XXXXXXXXXXXXX)

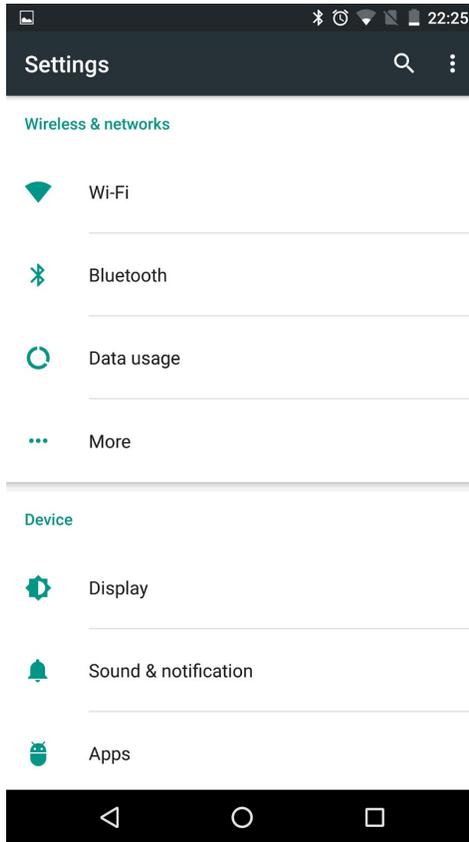
5.2.2. Android

- 5.2.2.1. Connect the phone to a computer using a USB cable.

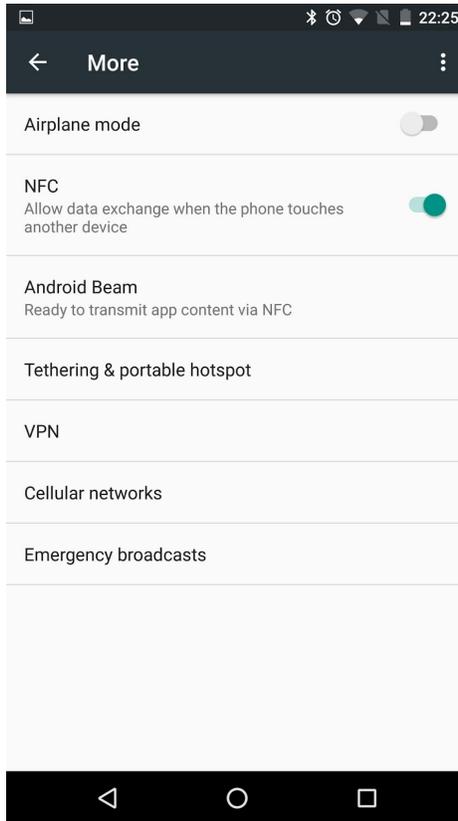
5.2.2.2. Open the Android settings on the phone



5.2.2.3. Select “More”



5.2.2.4. Select "Tethering & Portable Hotspot"



5.2.2.5. Enable “USB Tethering”



5.2.2.6. At this point, your computer should be able to access the internet

5.3. Wireless Hotspot

5.3.1. General Notes

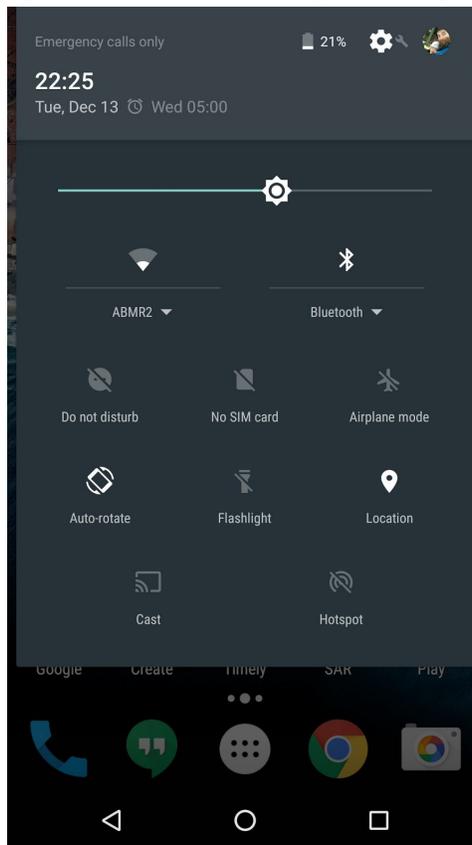
5.3.1.1. This is likely the most convenient method for getting several computers online, but it must be supported by both the phone hardware and the cellular data carrier.

5.3.1.2. If it is expected that other users will be wanting to access the ad-hoc network in the future, this is likely a better choice than USB tethering.

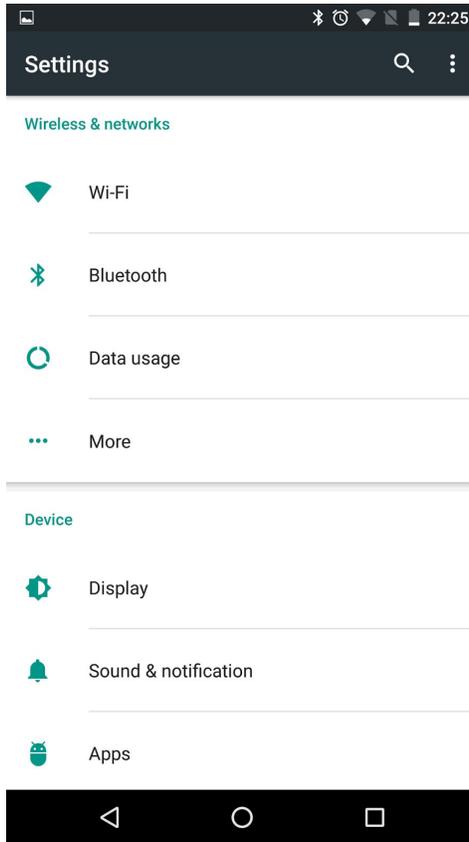
5.3.2. Android

5.3.2.1. Plug in the phone into a charger to provide a constant power source. Acting as a hotspot requires a significant amount of power, and the phone battery will drain quickly if not plugged in.

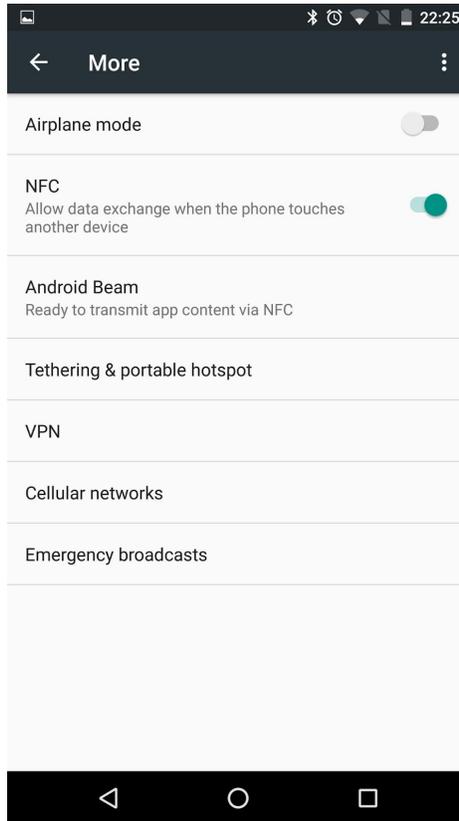
5.3.2.2. Open the Android settings on the phone



5.3.2.3. Select “More”



5.3.2.4. Select “Tethering & Portable Hotspot”



5.3.2.5. Click “Set up WiFi hotspot”, and do the following. When complete, press “Save”

- 5.3.2.5.1. configure a network name,
- 5.3.2.5.2. select security level (WPA2 PSK recommended),
- 5.3.2.5.3. create a password,
- 5.3.2.5.4. Select AP band (2.4 GHz recommended for broader device compatibility)

5.3.2.6. Enable “Portable Wi-Fi hotspot”



6. Use a Computer as a WiFi hotspot²

6.1. Windows 10

6.1.1. General Notes

6.1.1.1. In some cases, it may make more sense to use a computer as a wireless hotspot. This may be useful if working in a location that has wired internet access, but no wireless.

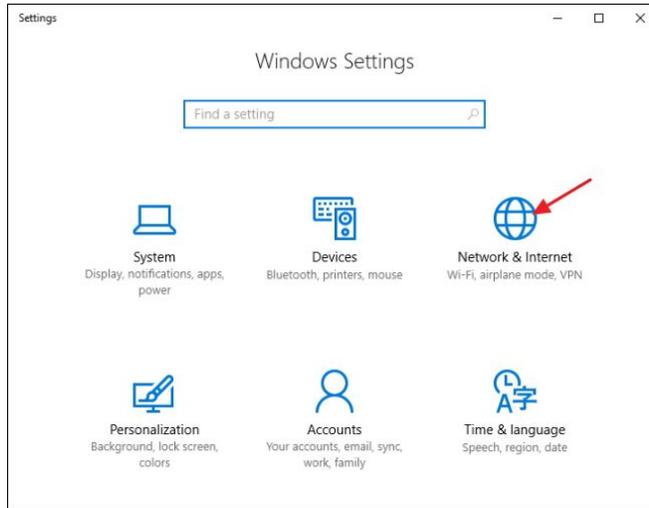
6.1.1.2. If one computer can be attached to the wired network, it can act as a hotspot for other computers to connect to wirelessly.

6.1.1.3. It can also be used to share a printer, even in cases where there is no internet access.

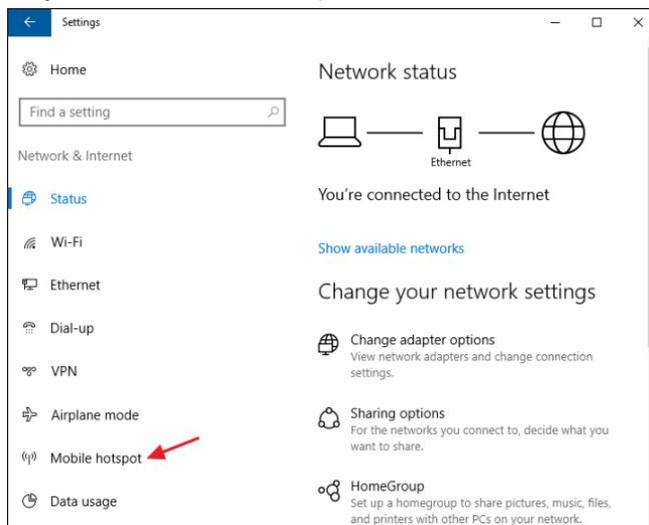
6.1.2. Open the Windows Settings. This may be done by opening the start menu and clicking on the **gear icon**, or by pressing **Windows+I** from any screen.

² Instructions and images from <http://www.howtogeek.com/214080/how-to-turn-your-windows-pc-into-a-wi-fi-hotspot/>

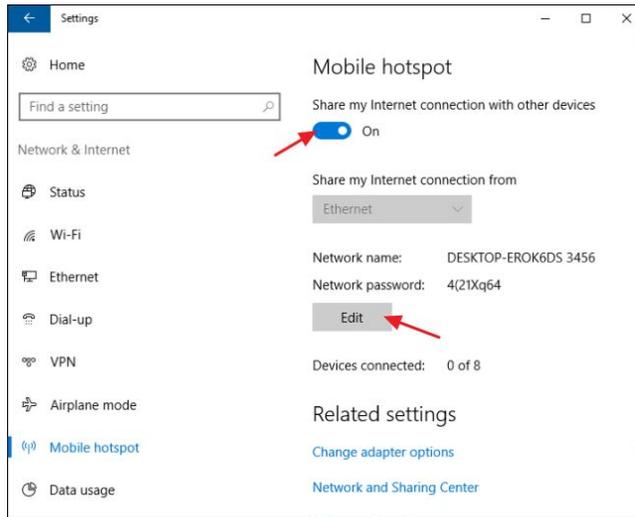
6.1.2.1. On the main settings page, click “Network & Internet”



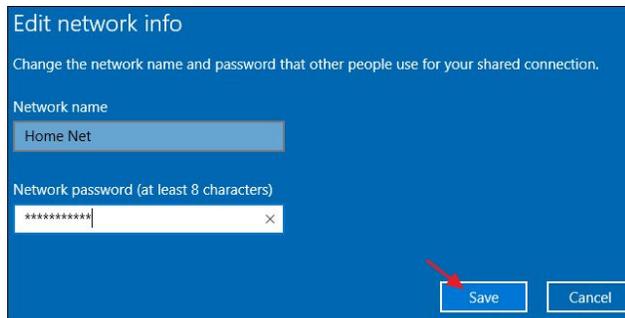
6.1.2.2. On the left-hand side of the page, click on “Mobile Hotspot” (you may need to scroll down)



- 6.1.2.3. Activate the hotspot by enabling “Share my internet connection with other devices”



- 6.1.2.4. Click the Edit button, and create an SSID and Password for the new access point.



- 6.1.2.5. Document the SSID and Password, and place the document in an appropriate place. For a sample document with relevant information, see [Appendix A](#).

Appendix A: Network Access Information Sheet

Wireless Network:

SSID	
Password	

Printer:

Printer Manufacturer	
Printer Model	
Printer Network Name	
Printer IP address	