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Assignment No. : 4
Branch : CSE DD

Topic : You are supposed to configure mobile devices viz. laptops, mobiles on infrastructure based wireless networks like cellular networks (GSM, 3G, 4G, HSPS etc.) and on infrastructure less network like ad-hoc and sensor network.

As it is not clear what I am supposed to do. I split this topic in two parts using **GUI** and **Terminal based approach**.

GUI Based Approach:

- **Mobile devices on infrastructure based wireless network**
 - Enable internet services on 4G, 3G or 2G enabled smartphone
 - Enable internet services on PC using USB tethering
 - Enable internet services on PC which have a SIM card and/or eSIM in them
 - Enable internet services on PC using ethernet connection
 - Other examples:
 - Setting ssh on two remote devices to execute commands or sharing files securely
- **Mobile devices on infrastructure less network like ad-hoc and sensor network**
 - Enable internet services on PC using smartphone hotspot
 - Enable internet services on PC using bluetooth tethering
 - Enable internet services on using wifi routers or dongle
 - Other examples:
 - Setting ssh on two nearby devices to execute commands securely

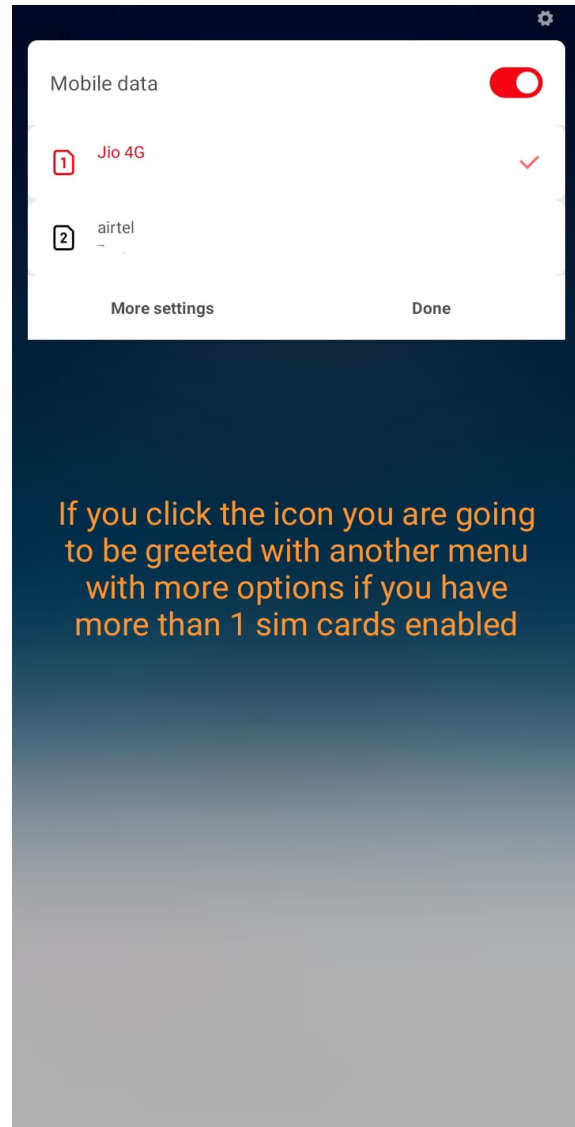
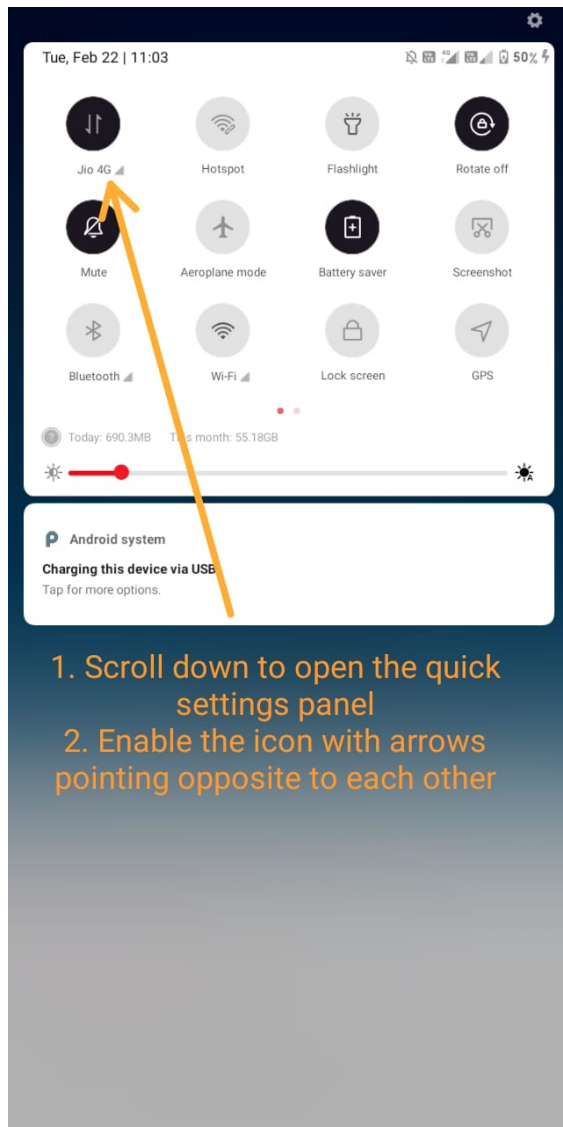
Terminal Based Approach:

- **Mobile devices on infrastructure based wireless network**
 - Using [nmcli](#) utility
- **Mobile devices on on infrastructure less network like ad-hoc and sensor network**
 - using [bluetoothctl](#) utility

GUI Based Approach:



- Mobile devices on infrastructure based wireless network
 - Enable internet services on 4G, 3G or 2G enabled smartphone¹

Steps:

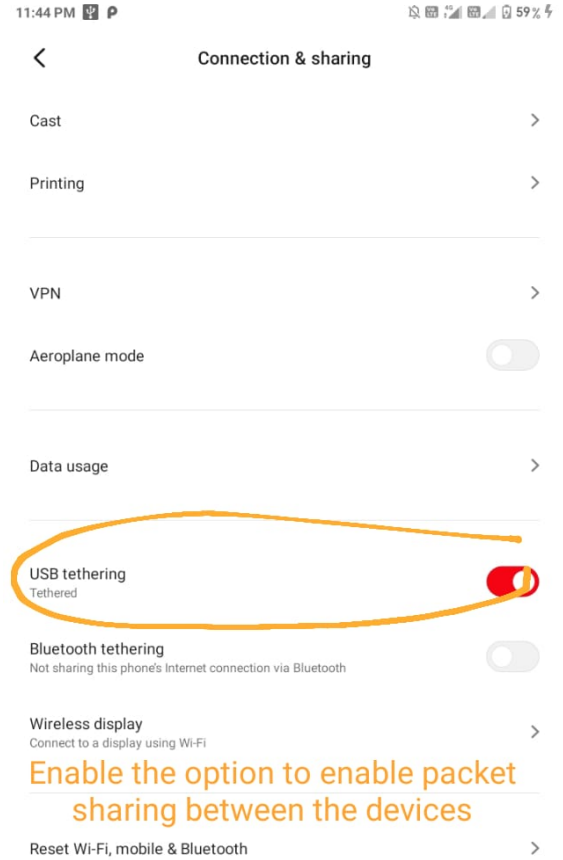
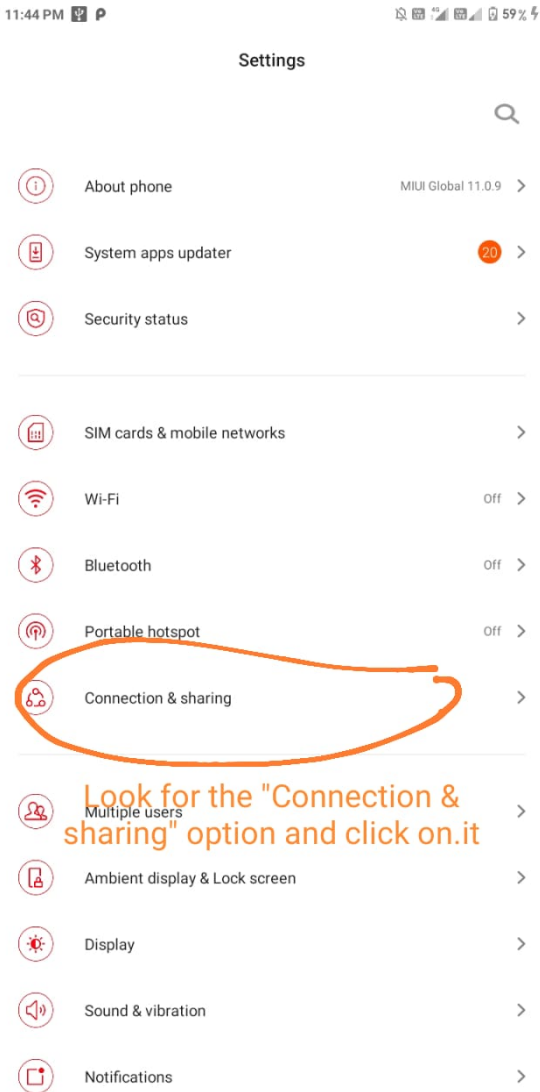


- Enable internet services on PC using USB tethering

Steps:

1. Firstly use the USB cable to connect the smartphone and the desired device with internet access capabilities.
2. Similar to the previous approach we can scroll down to open quick setting panel and click on the gear icon  or in some cases a stack icon  on the top borders.
3. The setting menu is going to appear.

¹ Assuming a stock android like interface running on Android 9



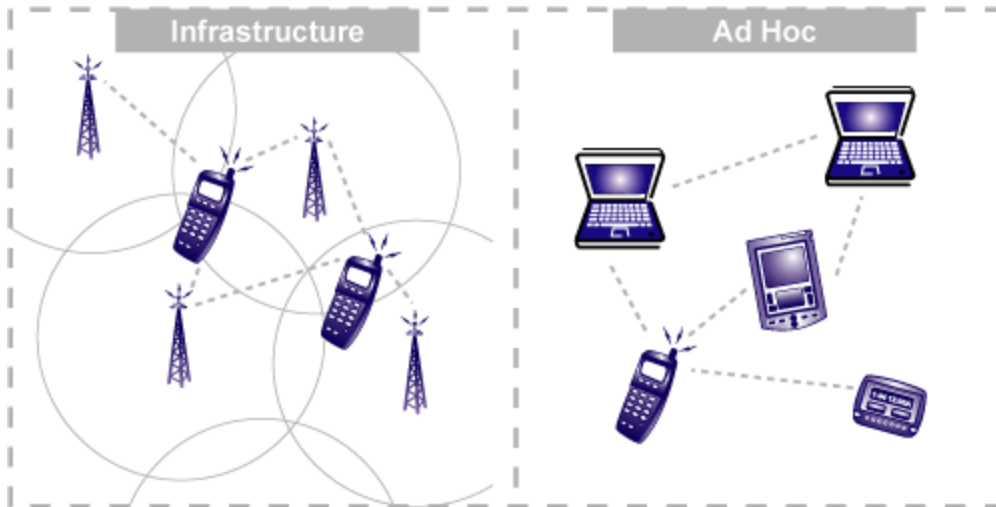
- **Enable internet services on PC which have a SIM card and/or eSIM in them**
Taking an example of a PC with Windows 10 as OS on it²
 1. Click/tap on the wireless network system icon on the taskbar notification area.
 2. Click/tap on an available disconnected cellular data network you want to connect to.

² These images are collected from [TenForums/Cellular network using SIM or eSIM in PC](https://www.tenforums.com/network-sharing/1111111) and used just for educational purposes.



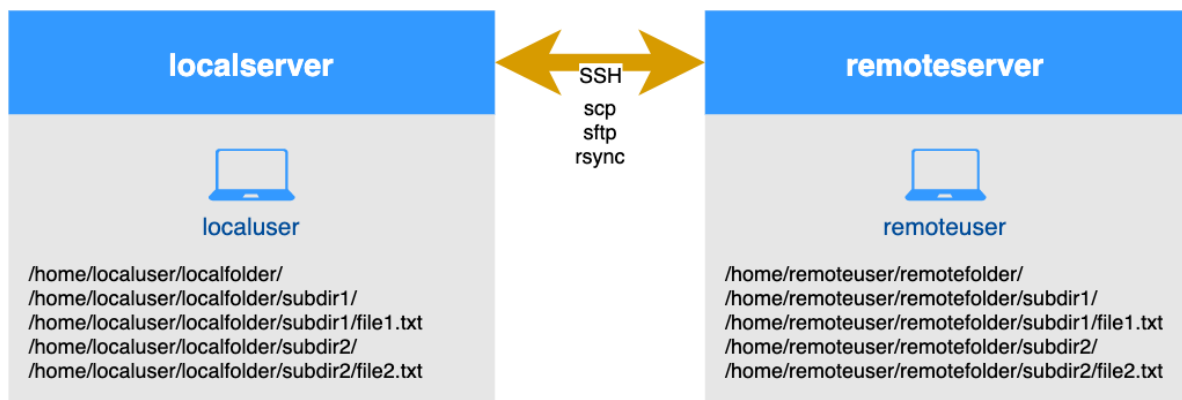
Note: Wi-Fi has two working modes - IBSS (ad-hoc) and BSS (infrastructure mode). The main difference between these two modes is access-point. This kind of device is available only in infrastructure mode.





1. In ad-hoc mode when station A wants to transmit a frame to station B it just transmits this frame to station B.
2. In infrastructure mode, station A at first transmits this frame to access-point, and access point retransmits this frame to station B.



- **Enable internet services on PC using ethernet connection**
Assuming ethernet infrastructure on the place of accessing. Connect the ethernet cable to the desired device having RJ45 port, if not available use an adapter/converter.
- **Setting ssh on two remote devices to execute commands or sharing files securely**

I'm taking an example with which I have some experience. Sometime you I really need to take security to the next step. Suppose you setup a home server in which you store all the important files and you want to access it remotely. You can setup a ssh server in home server and open a port for remote access. Then connect to the server to access the files encrypted by the ssh.



- **Mobile devices on infrastructure less network like ad-hoc and sensor network**
 - **Enable internet services on PC using smartphone hotspot**
 1. Similar to the previous steps a link has to be made between two or more devices. On the smartphone enable the hotspot icon  and enable the wifi icon on the desired device .
 2. If the password is set to the hotspot network then the device with the wifi enabled has to put the correct password to connect and get access to the packet sharing.
 - **Enable internet services on PC using bluetooth tethering**
 1. Similar to the previous steps a link has to be made between two or more devices. On the smartphone enable the bluetooth icon  and enable the bluetooth icon on the desired device .
 2. A prompt appears on both sides to accept or reject the bluetooth setup.
 3. Now the device with active internet connection opens the setting and look for the “Connection & sharing” option.
 4. After clicking the option there a new panel open with a toggle button to enable bluetooth tethering.
 - **Enable internet services on using wifi routers or dongle**
 1. Similar to the other ways, in this we can use a wifi router or dongle to get wireless internet connection (assuming the wifi router/dongle is connected to the internet).
 2. In the desired device, similar to connecting to a wifi from a newby smartphone. You have to select the wifi router or dongle and enter the password (if required) which is either provided by the ISP or in case the dongle is printed on the back inside the case.



- Other examples:
 - Setting ssh on two local/nearby devices to execute commands or sharing files securely #gentoo-install

I'm taking an example with which I have some experience. While I was installing gentoo on my potato pc it is tough to write all those important config commands and one error leads to a not working installation at the end. So, I came up with an idea to use ssh to connect my laptop and potato pc using mobile hotspot without internet connection as with many file sharing applications which work on wifi to send/transfer files. Similarly, we can communicate.



Terminal Based Approach:

- Mobile devices on infrastructure based wireless network
 - Using [nmcli](#) utility

```
09:23:56 aanya@fedora ~ → nmcli radio wifi on
09:23:59 aanya@fedora ~ → nmcli dev wifi list
IN-USE BSSID SSID MODE CHAN RATE SIGNAL BARS SECURITY
09:24:01 aanya@fedora ~ → nmcli dev wifi list
IN-USE BSSID SSID MODE CHAN RATE SIGNAL BARS SECURITY
       7E:03:5E:0B:EC:94 Peer Infra 6 117 Mbit/s 35 WPA2
09:24:04 aanya@fedora ~ → nmcli dev wifi connect Peer password helloPeer
Device 'wlp2s0' successfully activated with 'ec420e54-ccfe-4542-81f6-0f7d28c8ba32'.
09:24:25 aanya@fedora ~ → nmcli dev status
DEVICE TYPE STATE CONNECTION
enp0s20f0u4 ethernet connected Wired connection 2
wlp2s0 wifi connected Peer
p2p-dev-wlp2s0 wifi-p2p disconnected --
enp1s0f1 ethernet unavailable --
lo loopback unmanaged --
```

I think this utility can be considered as infrastructure based because at the end the goal of this approach is to connect to the internet. So, the wireless network requires a physical structure to support it.

- Mobile devices on infrastructure less network like ad-hoc and sensor network
 - Using [bluetoothctl](#) utility

```
10:19:41 aanya@fedora ~ → bluetoothctl
Agent registered
[CHG] Device 7C:03:5E:1B:EC:94 RSSI: -57
[bluetooth]# scan on
Discovery started
[bluetooth]# devices
Device 7C:03:5E:1B:EC:94 Redmi
Device 2C:FD:AB:54:81:57 marino f
[CHG] Device 7C:03:5E:1B:EC:94 RSSI: -45
[bluetooth]# pair 7C:03:5E:1B:EC:94
Attempting to pair with 7C:03:5E:1B:EC:94
[CHG] Device 7C:03:5E:1B:EC:94 Connected: yes
Request confirmation
[agent] Confirm passkey 500489 (yes/no): yes
[CHG] Device 7C:03:5E:1B:EC:94 Modalias: bluetooth:v0046p1200d1436
```

I think this utility can be considered as infrastructure less because at the end the goal of this approach is to connect to the nearby devices like speakers, headphones, file transfers(now absolutely absolute) . So, the wireless network requires a physical structure to support it.

I can discuss the constraints and limitations of the above approach but thought that they are out of the scope of this assignment like speed, human device interaction, number of users can be connected, learning curve, etc. I don't know what to do so I left that part untouched for this assignment.