

PCs and Amateur Radio

Presentation Topics

- **Ham Station Logging – First PC Use**
- **Engineering Design and Computing Field Data**
- **Hardware Controls**
- **Radio Configuration Setup**
- **Radio Operating & Networking**

Station Logging – First PC Use

- **Original use of PCs and software was for Station Logging**
- **Station logging was FCC mandatory many years ago**
- **Software was originally written by N1MM, Ham Radio Deluxe (HRD), N3FJP, and others**
- **These programs morphed themselves in to contest logging programs, Voice & CW keyers, RTTY, FT8, and station control programs which have improved and are still in use today.**

Engineering Design and Computing Field Data

- **Excel Spreadsheets were and are still used today for many complicated calculations**
- **VSWR Calculations**
- **Return Loss Calculations**
- **Antenna calculations (EZNEC Antenna Software by W7EL)**
- **Coax Calculations (Tuned stubs, Filters, etc...)**

- **Tuned circuit calculations**
- **Station hardware controls and automation**
- **Automatic antenna matchers (aka antenna tuners)**
- **Rotor controls**
- **Satellite earth station controls**
- **Some of these tasks may be performed remotely via the Internet.**

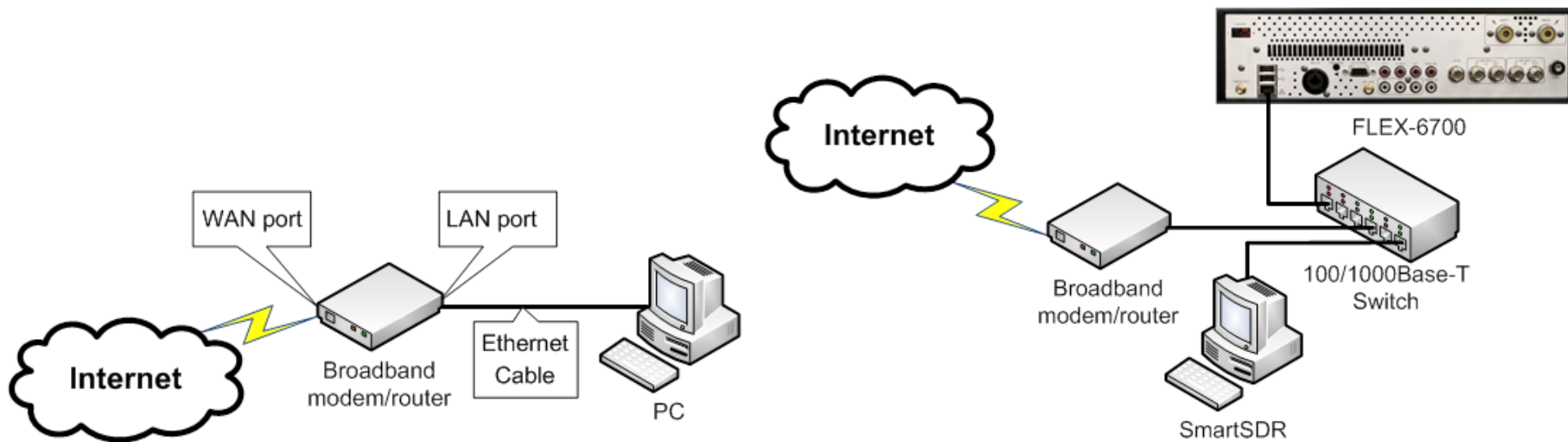
Radio Configuration setup

- **This is the process of loading parameters in to a radio**
- **This includes HT's, Base Stations (HF, VHF/UHF & Digital Radios)**
- **Software that can be used**
 1. **RT Systems software**
 2. **Chirp**
 3. **OEM (Kenwood, Yaesu, and ICOM, Baofeng, Anytone, Wouxun, etc...)**
 4. **Interfaces used are RJ-45, RS-232, USB, and proprietary connections.**
 5. **When using USB cables, make sure they use FTDI chipsets or the OEM chipsets. Some OEM vendors use Silicon Labs chipsets. Prolific chipsets should be avoided. In the past, they have been problematic.**

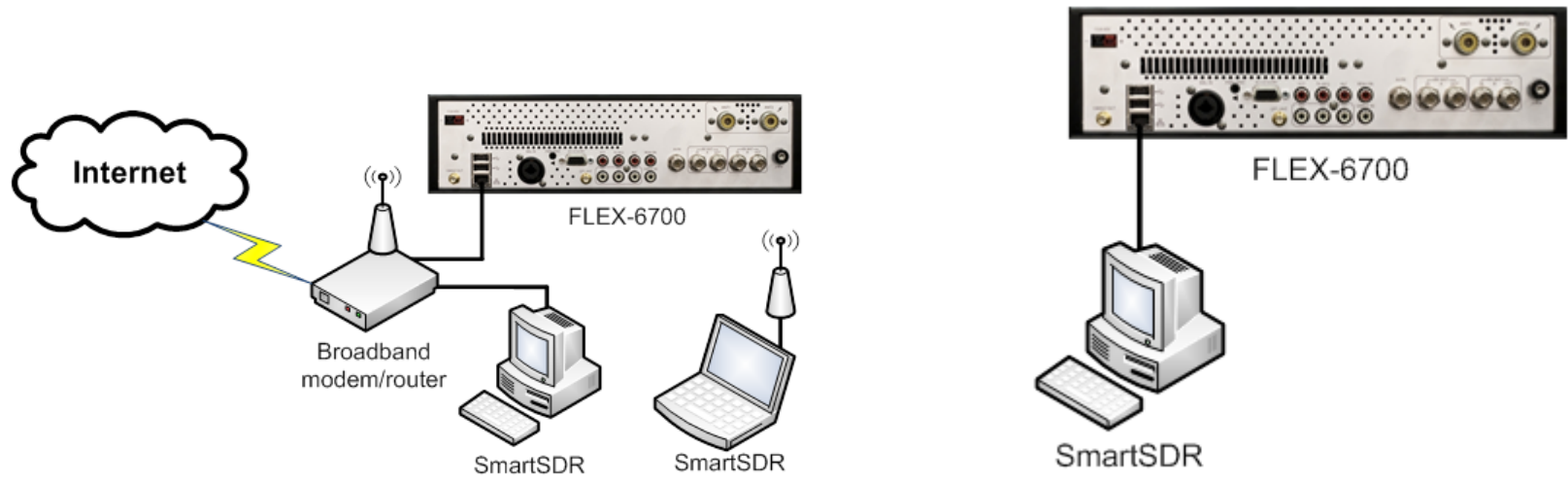
Radio Operation and Networking – Started With SDRs ?

Flex Radios (SDR)

Ethernet Connection



Flex Radios (SDR) Continued

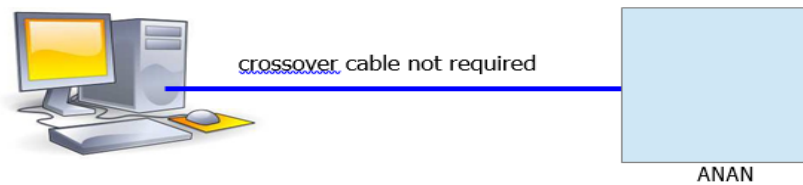


Apache Labs Anan (SDR)

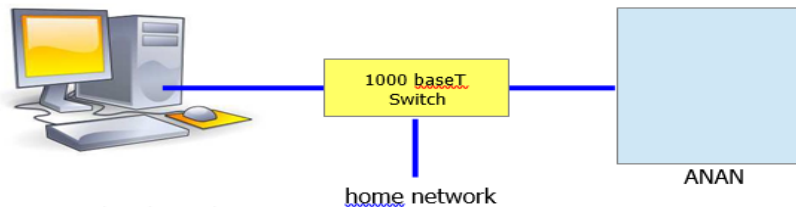
Suitable routers or LAN Network switches:

A Full Duplex wired or wireless Ethernet Router with sufficient ports to connect the host computer and the ANAN-100/100D/200D at 1000 baseT required to handle 80Mbps. Optional Full Duplex Ethernet 5 port **switch** with 1000 baseT Internet connectivity may be required if additional Ethernet ports are needed. Ethernet **HUBS** will **NOT** work properly for this application.

Ethernet Connection



The ANAN must be connected directly to a dedicated Ethernet port on the host PC or to a port on a suitable Ethernet router or switch. Connection to a dedicated Ethernet port is shown above



Ethernet switch is shown above

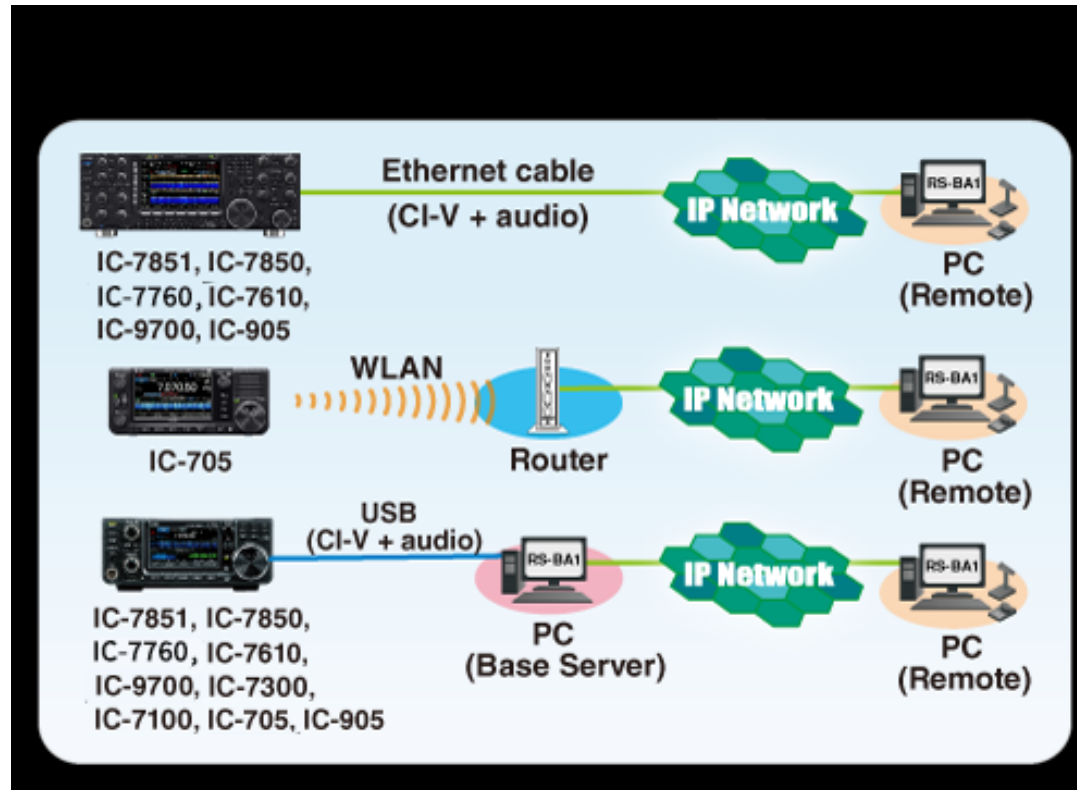
For direct connection of the ANAN to a dedicated Ethernet port, a CAT 5 Ethernet cable is used. Note that a 'crossover' cable is **not** necessary.

IMPORTANT: The Ethernet switch must be capable of operating in **full duplex** mode at 1000 baseT. The initial release of the ANAN FPGA code operates at 100 baseT, but future releases will run at 1000 base-T. For this reason, a 100 baseT Ethernet switch may be used in the interim, but if a new purchase is planned then a **1000 baseT switch is recommended**.

An Ethernet "HUB" will not work properly and is **not** recommended.

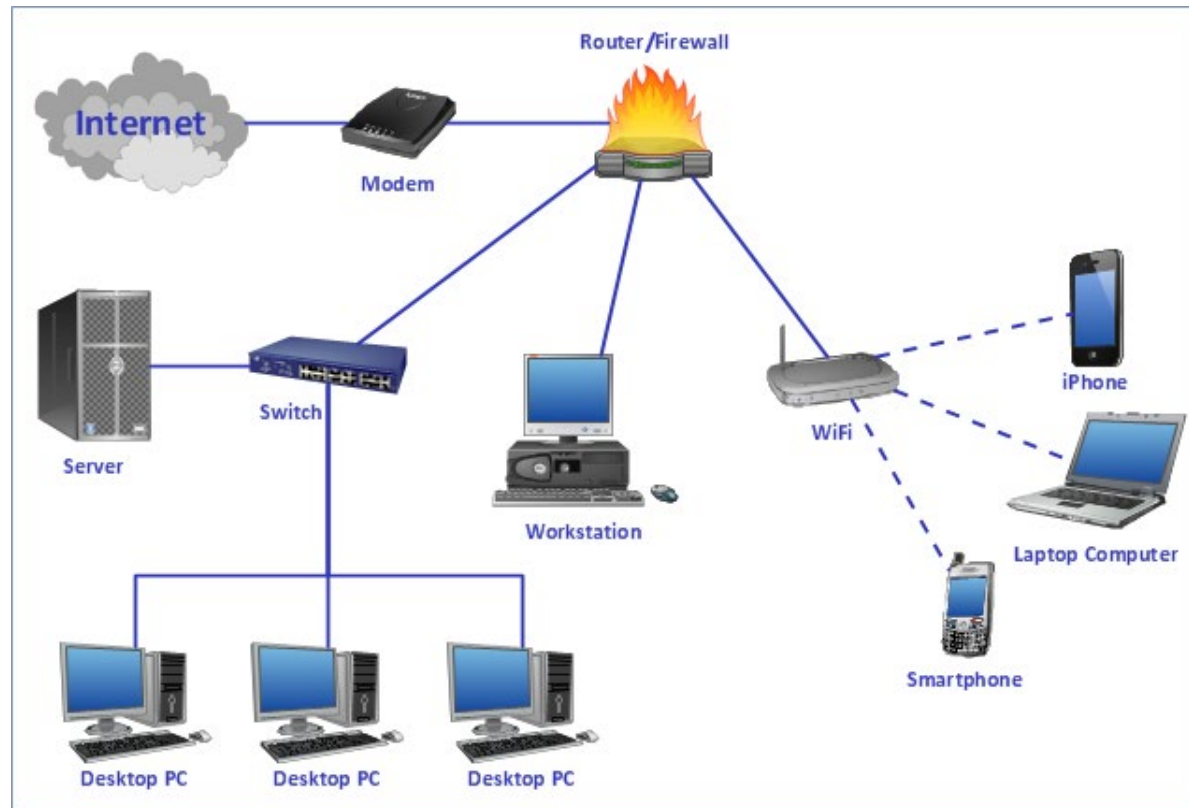
ICOM Radios (Late Models)

RS-BA1



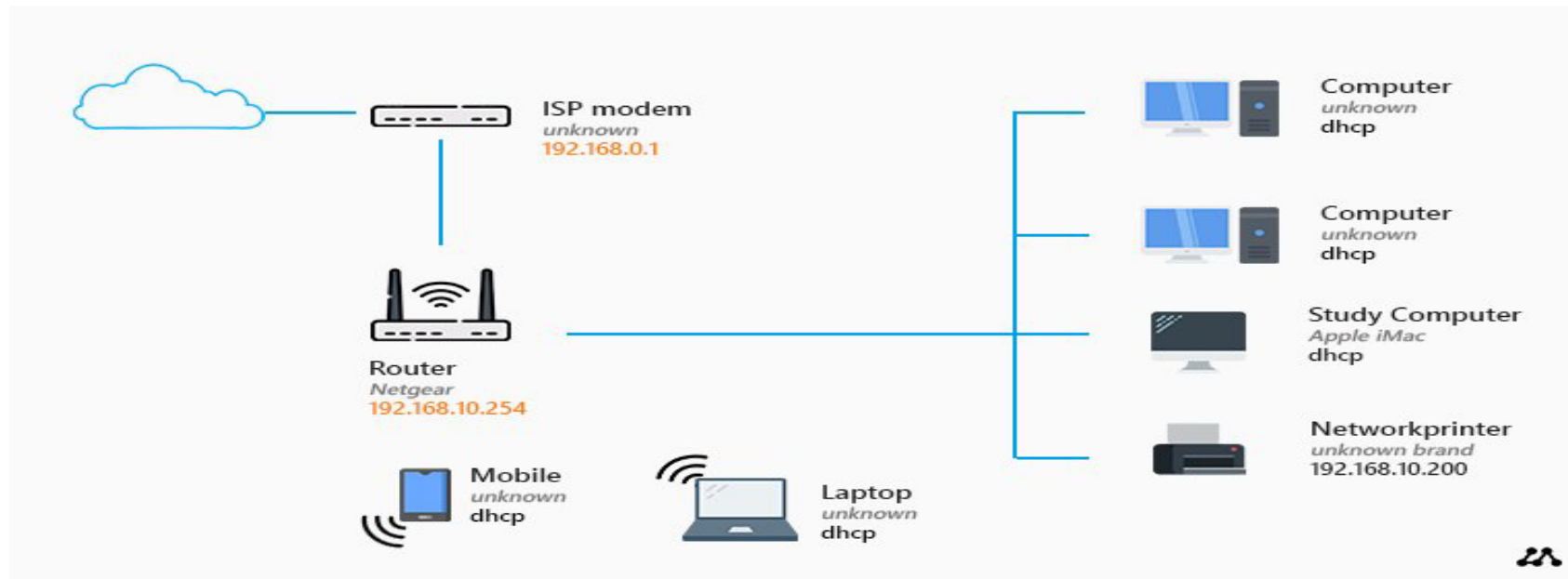
The “IP Network” shown can be Local or Internet (with appropriate equipment)

Typical Network Retail Interface Equipment



1. Modem can be supplied by Customer or ISP
2. Router/Firewall can be supplied by Customer or ISP
3. In This example, the “server” is the Radio and/or OEM software/control equipment

The Home Router/Firewall Operation

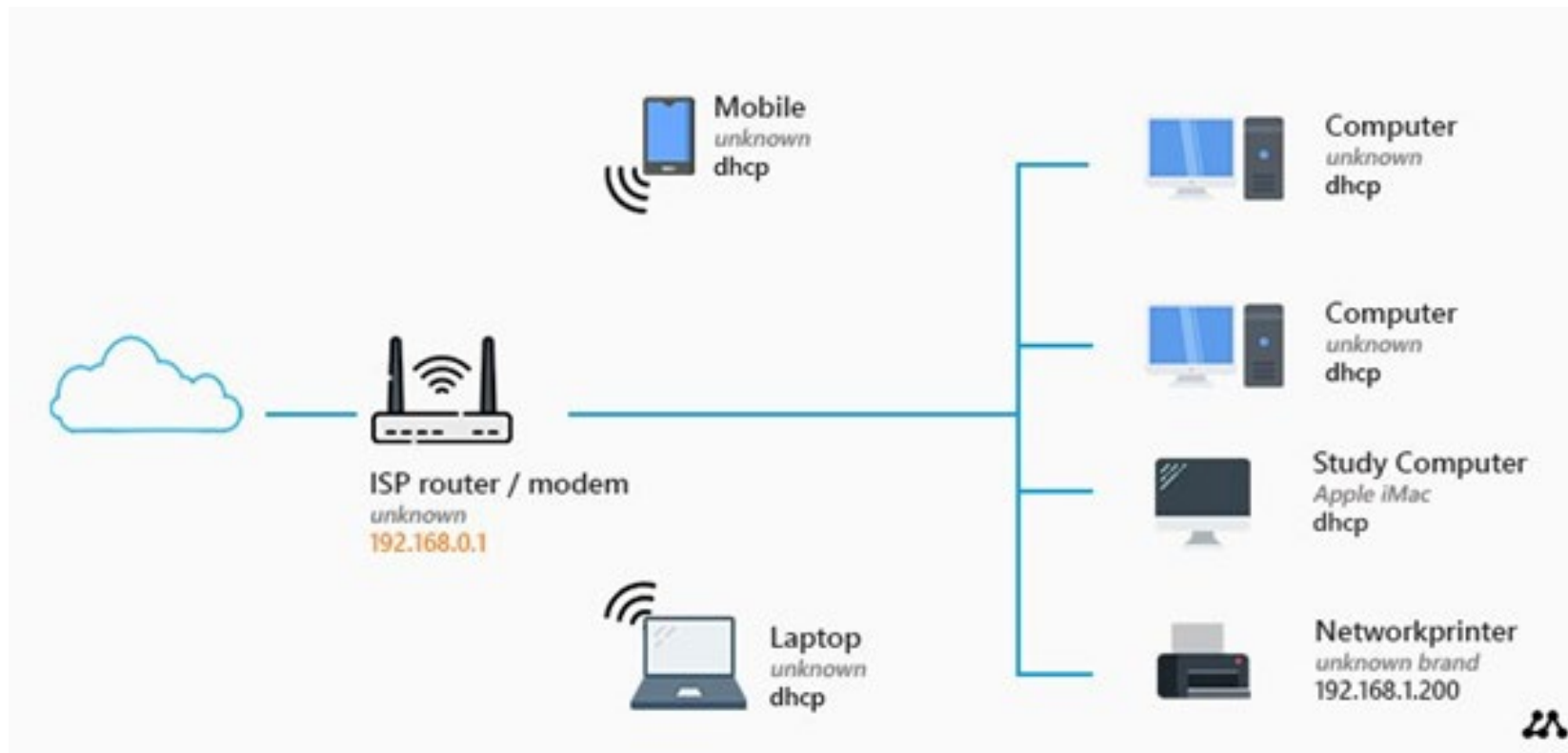


1. The Router connects the WAN (outside) to the LAN (inside) networks
2. The home router/firewall isolates the internal network from the outside world
3. Network Address Translation (NAT) is used to connect multiple users to the single outside address
4. This is similar to a single address apartment building which houses many tenants.
5. Normally, the Firewall/Router allows traffic to flow outbound freely and blocks all inbound traffic unless it was requested by the user's outbound traffic.
6. The Router/Firewall Tracks/Syncs the outbound traffic with the inbound responses.

Networking To The Outside World

(ISP Supplies Modem Router/WiFi)

Router/WiFi May Not Be Configurable



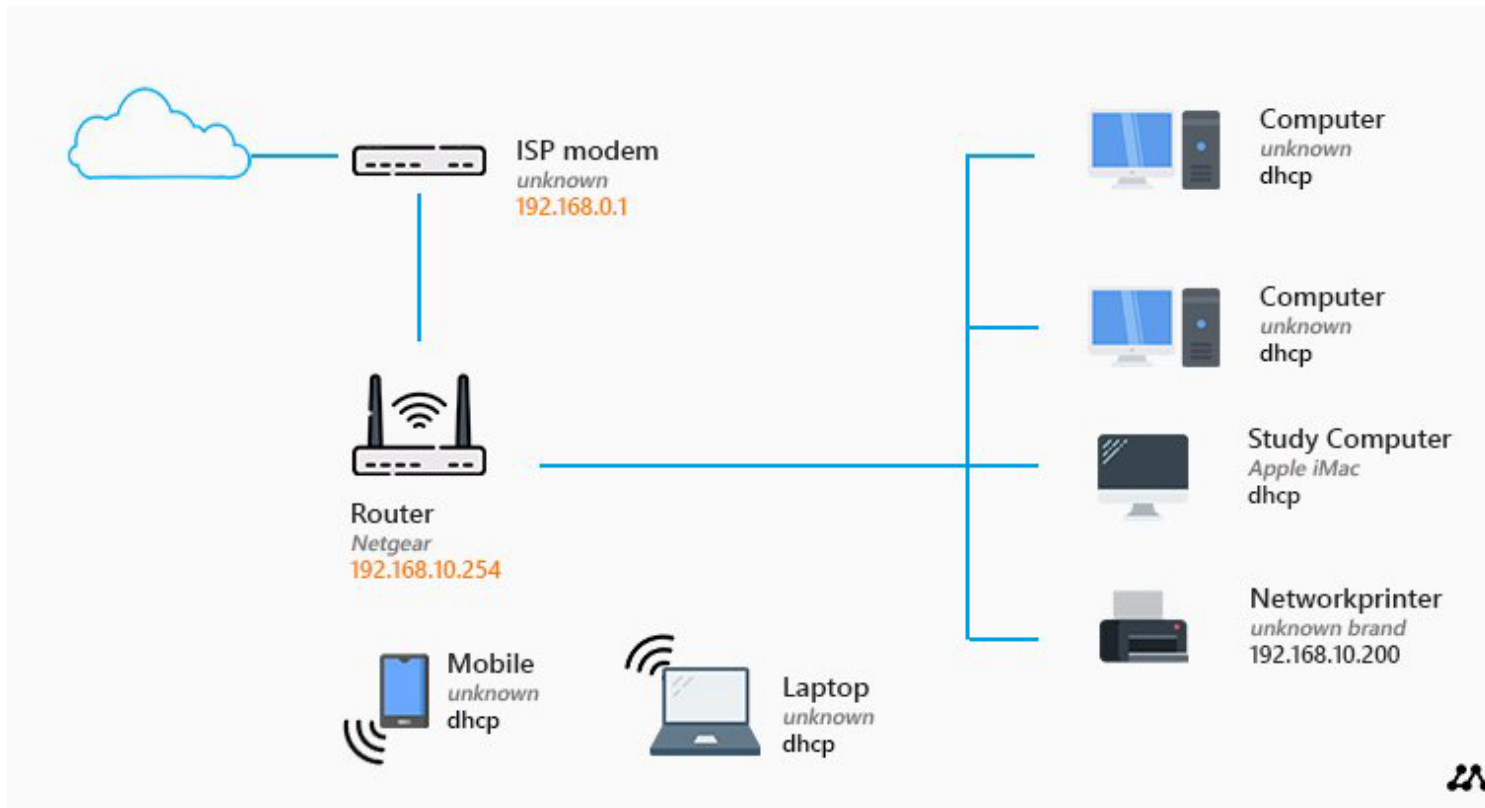
An ISP provided router/modem. Usually the ISP won't allow you to reconfigure the router.

Dynamic Host Configuration Protocol (DHCP) is a network protocol that automatically assigns IP addresses and other configuration information to devices on a network

Networking To The Outside World

(ISP or Customer Supplies Modem)

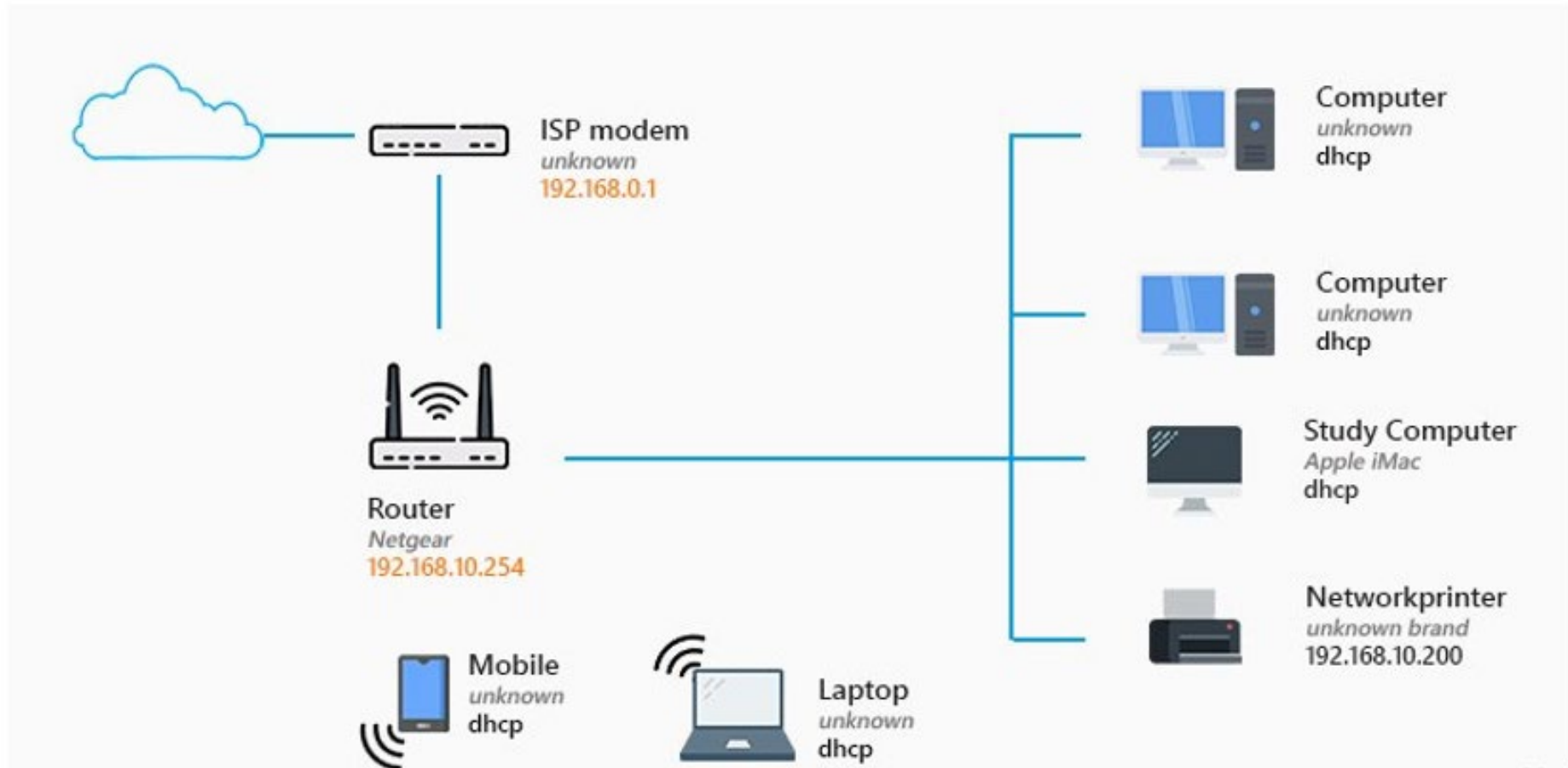
Router/WiFi Is Configurable



Typical ISP provided modem. The user provided Router/Firewall is configurable.

Dynamic Host Configuration Protocol (DHCP) is a network protocol that automatically assigns IP addresses and other configuration information to devices on a network

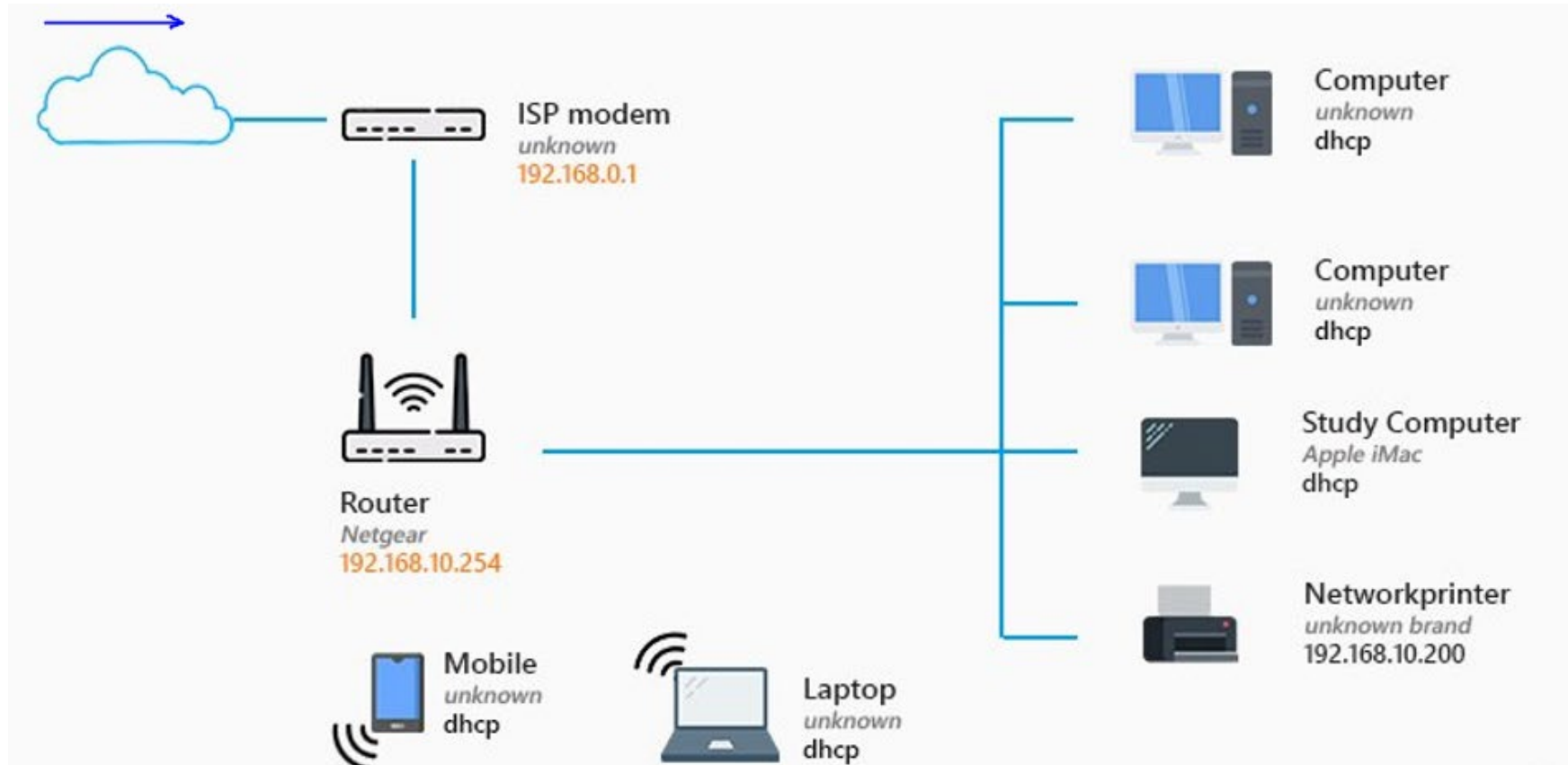
Outbound Traffic Is Usually Not Blocked To The Cloud



Typical ISP provided modem. The user provided Router/Firewall is configurable.

Dynamic Host Configuration Protocol (DHCP) is a network protocol that automatically assigns IP addresses and other configuration information to devices on a network

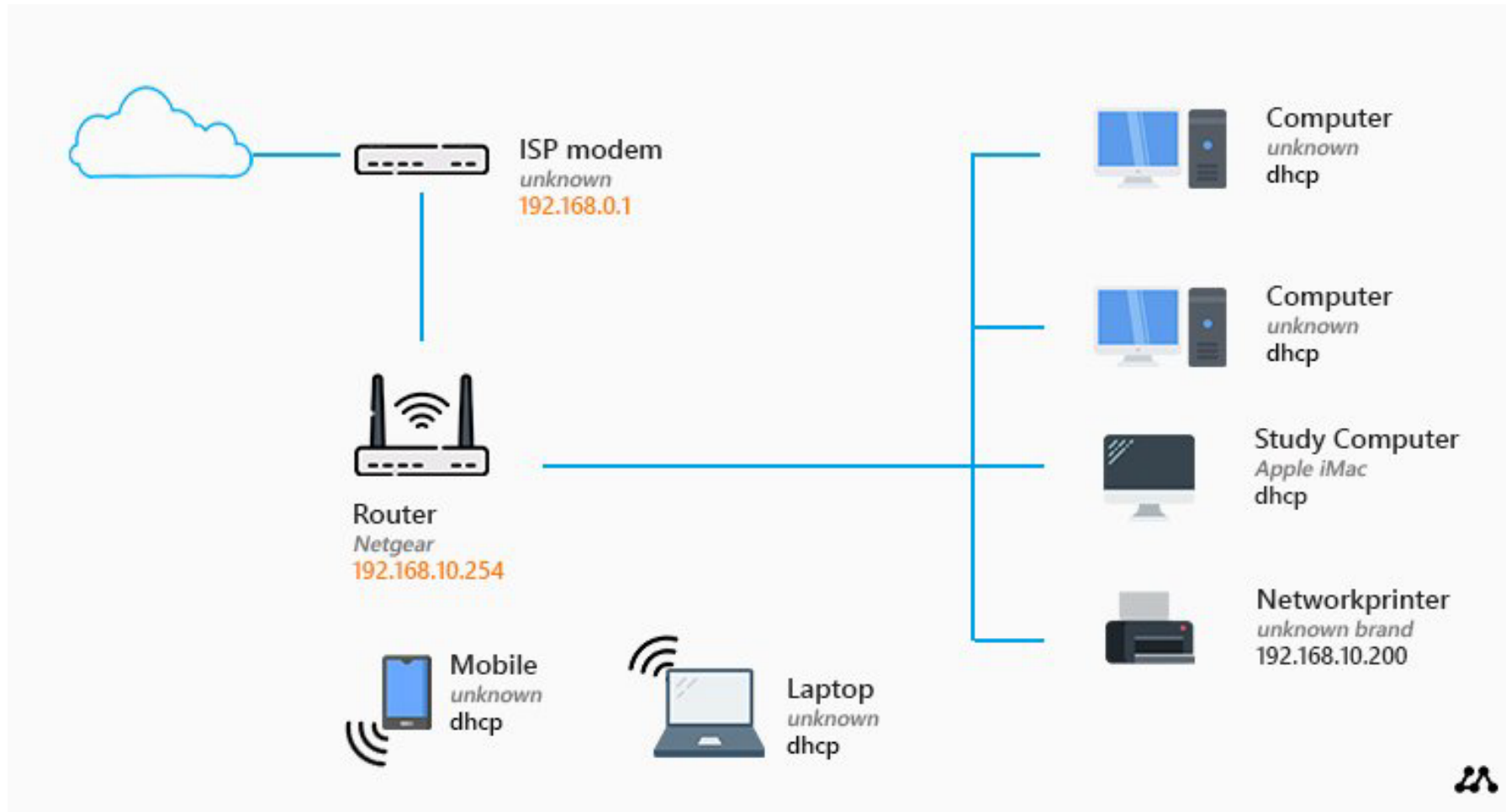
Inbound Traffic From The Cloud Is Normally Blocked



Typical ISP provided modem. The user provided Router/Firewall is configurable.

Dynamic Host Configuration Protocol (DHCP) is a network protocol that automatically assigns IP addresses and other configuration information to devices on a network

Traffic Flow



Unblocking The Router/Firewall

- **Most Protocols & functions are assigned port numbers. There are 2¹⁶ (65536) ports available. Port assignments are not cast in concrete.**
- **Some Of The Typical Port Numbers are:**
 - HTTP – Port 80
 - HTTPS – 443
 - FTP – 21
 - FTPS / SSH – 22
 - POP3 – 110
 - POP3 SSL – 995
 - IMAP – 143
 - IMAP SSL – 993
 - SMTP – 25 (Alternate: 26)
 - SMTP SSL – 587
 - MySQL – 3306
 - cPanel – 2082
 - cPanel SSL – 2083
 - WHM (Webhost Manager) – 2086
 - WHM (Webhost Manager) SSL – 2087
 - Webmail – 2095
 - Webmail SSL – 2096
 - WebDAV/WebDisk – 2077
 - WebDAV/WebDisk SSL – 2078
- **Remote Software/Servers usually use ports in the 3000 and 5000 series.**

Unblocking The Router/Firewall (con't)

- The appropriate ports (see OEM Instructions) must be unblocked
- This is known as port forwarding
- Each router has a different technique to perform this task
- Port forwarding must be assigned to the server/PC's IP address in the router/firewall. OEM radio equipment may contain a server.
- The IP address of the server (radio) must be given a static address. No DHCP assigned address should be used. Make sure the address is unassignable (within the DHCP range) and it is in the same octet.
- Example: In the previous illustration, using 192.168.10.175 will suffice. Please note: The static address of the printer is 192.168.10.200

Additional Suggestions

1. Check to see if the ISP's equipment is user configurable
2. Download the OEM equipment manuals BEFORE you purchase
3. Look at You Tube Videos on various Network Components
4. Look at You Tube Videos on Networking, Controls, and Radio Equipment

Additional Subject Material

1. Steve Gibson's "Three Dumb Routers"
<https://pcper.com/2016/08/steve-gibsons-three-router-solution-to-iot-insecurity/comment-page-2/>
2. Steve Gibson's ShieldsUp Program <https://www.grc.com/shieldsup>
3. Ubiquiti Routers <https://store.ui.com/us/en?category=all-wifi>
4. Mikrotik Routers <https://mikrotik.com/products/group/ethernet-routers>
5. Public and Private Network Address Discussion
<https://help.keenetic.com/hc/en-us/articles/213965789-What-is-the-difference-between-a-public-and-private-IP-address>