Cascading Two NETGEAR Routers

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If your residence has two widely separated locations and you want wired and wireless access to the internet in both locations as well as communication between all computers, then a "peer-to-peer" network using two series-connected routers is probably the easiest solution. We assume that the "widely separated locations" do have a single wired Ethernet cable connection. In my case, the locations are the main residence and a pool house in the back yard, connected through an underground Ethernet cable.

The final network has one router in each location. The router R1 is connected to the Broadband Modem, the second router, R2, and some computers. Router R2 is connected to R1 and some more computers (and a printer). Both routers are wireless as well as wired and we want the wireless functionality to be present too in the final network. The description below is based in large part on information in the following link:
http://kbserver.netgear.com/inquira/default.asp?ui_mode=answer&prior_transaction_id=9367&action_code=5&highlight_info=16777288,42,46&turl=http%3A%2F%2Fkbserver.netgear.com%2Fkb_web_files%2FN101496.asp&answer_id=117494146#__highlight

Below we use the term PC for any Windows based computer (includes laptop).

- R1 = Router1 = Internet router = router connected to Broadband Modem through its unigue "WAN" port (as opposed to any of its 4 LAN Ethernet ports) = NETGEAR 54Mbps Wireless Router WGR614 v5 (supports 802.11b,g)
- R2 = Router2 = Router/Access Point = router connected to Internet router but not to Broadband Modem = NETGEAR 54Mbps Wireless Router WGR614 v8 (supports 802.11b,g)
- PC1 = PC ethernet wired to R1 through one of its 4 LAN ports
- PC2 = PC ethernet wired to R2 through one of its 4 LAN ports

R1 and R2 are identical, but v8 was bought about 3 years later than v5. Starting situation: R1/PC1 group of devices is NOT connected to R2/PC2 group of devices.

NOTE 1: If for any reason, during the steps below, connection to a router can no longer be established in any software manner, the router may have to be hardware reset. Use a sharp object (end of paperclip, or nail) and, with the router powered on, press it into the small ROUND opening on the back to the left of the antenna for about 20 seconds (other small holes are square).

NOTE 2: During some of the operations below, it can be useful to sometimes release a PC's IP address and renew it (rather than restart the PC). This can be done from start > run, enter cmd, click ok, at the console prompt enter: ipconfig <enter> (to see what current IP address is), then type ipconfig /release <enter>, then type ipconfig /renew <enter>. The new IP address information will show. The command ipconfig –h shows various options.

Step 1. Get R1's IP address.

1. On PC1, choose start > run, enter "cmd", click ok.
2. In the command window (normally with a black background), at the prompt, type: ipconfig <enter>
3. The 1st line shows the IP address of the PC, the 3rd line "Default Gateway" shows R1's IP address.
   NOTE 1: In my case, the R1 IP address is 192.168.44.1. This means that I changed it long ago from its original (shipping) 192.168.1.1. We will continue to use this IP address below.
   NOTE 2: The IP addresses of ALL devices (routers, PCs, printers, etc.) on the future network have to have the first three IP address numbers identical. In my case, this means all IP addresses look like 192.168.44.xx. If you divert from this, it is called "sub-netting" and I do not know anything about it.

Step 2. Configure R1. Record R1's wireless settings.

1. On PC1, open a browser window, in the address bar type: http://192.168.44.1
2. When prompted, enter:
   a. User name = admin
   b. Password = password
3. In the NETGEAR SMARTWIZARD router manager, on the left, click LAN IP Setup.
   NOTE: The middle screen's 1st line should confirm R1's IP, namely 192.168.44.1. If you needed to change it, do it now. If you change it, be sure to remember it, since you will loose the PC1-R1 connection after hitting "Apply". Afterwards, just navigate to R1 again from PC1 using the new IP address (you may have to first from cmd window use >ipconfig /release <return> and then >ipconfig /renew <return>). (A less preferred way is to restart PC1 and then follow Step 1 above).
4. By default, "Use Router as DHCP Server" is selected, and we leave this so. But we will limit the IP address range. This is the range that the DHCP process will use to automatically assign IP addresses on the network. "Reserved" IP addresses (see **Step 6**) also must fall into this range. We limit the DHCP range, so that R2's address (see **Step 3**) can be chosen OUTSIDE this range. R1's own address must also be OUTSIDE this range. In my case, I chose:
   a. Starting IP Address = 192.168.44.2
   b. Ending IP Address = 192.168.44.51
   NOTE: R1's IP = 192.168.44.1 is indeed outside this range.
5. For future reference, we record R1's wireless settings. In the router manager, on the left, select Wireless Settings (under Setup). Record:
   a. Name (SSID) = xxxxxxx (Default is NETGEAR, there is no need to change this, but you may).
   b. Channel = xx (Default is 11, there is no need to change this. If you change it, pick one of the non-overlapping channels 1, 6, or 11. I left it at 11).

Step 3. Configure R2, Part 1 (IP address).

1. Do not run the setup CD. All you need to know is:
   a. Router initial IP address = 192.168.1.1
   b. User name = admin
   c. Password = password\
   The NETGEAR router manager software is so well done that normally no manuals need to be read to use it. The router manager screens themselves continuously explain in a right-hand side panel what various options mean.
2. On PC2, open a browser window, in the address bar type: http://192.168.1.1 (R2's shipping IP). If for some reason this is not working, R2's IP address is different (or the Ethernet cable connection between PC2-R2 is having a problem: Make sure to NOT use the unique WAN port on R2, any of the 4 LAN ports are fine). You can try to find it out from the setup manuals (e.g. read manuals on the CD). If this does not work, a brute force way is to power down R1 and PC1, then power on R1, then power on PC1, then use Step 1 above to figure out R1's IP). Alternatively, NETGEAR suggests you use the alias http://www.routerlogin.com. Once you are in, you can find the IP address from the LAN IP Setup screen. In bad cases, these procedures maybe combined with a hardware router reset (described before **Step 1**).
3. When prompted, enter:
   a. User name = admin (Shipping default. If not, consult NETGEAR manuals).
   b. Password = password (Shipping default. If not, consult NETGEAR manuals).
4. In the NETGEAR SMARTWIZARD router manager, on the left, click LAN IP Setup.
5. Change the IP address to 192.168.44.99 (or anything outside the **R1** DHCP range).
   NOTE: Do NOT change anything else. In particular, leave the "Use Router as DHCP Server" section untouched. Here we critically DIFFER from the description in the link mentioned in the beginning.
6. Hit "Apply". After a short while, PC2 will loose connection to R2, since it IP address changed.
7. On PC2, open a browser window, in the address bar type: http://192.168.1.99 (R2's new IP). Login by giving the usual User name and Password.

Step 4. Bring up the network. Configure R2, Part 2 (DHCP off).

1. Connect an Ethernet cable from any free R1 LAN port to any free R2 LAN port.
   The connections R1/PC1 and R2/PC2 are simply left in place.
   NOTE: We will NEVER connect anything to R2's WAN port.
2. From PC2, in R2's setup screen, go to LAN IP Setup.
3. NOW uncheck "Use Router as DHCP Server". Hit "Apply".
   NOTE: The final network has a single DHCP server, namely R1.
4. Turn off ALL devices in the full network, including your Broadband Modem
   (attached to R1).
5. Turn on the Broadband Modem. Wait about 1 minute until several relevant lights
   are lit (e.g. "DSL").
6. Turn on R1. Wait about 30 seconds until all its lights are stable.
7. Turn on PC1. All should be well on PC1 (i.e. www.google.com should work).
8. From PC1, log into R1 with URL http://192.168.1.1.
9. In the R1 NETGEAR SMARTWIZARD router manager select Attached Devices
   (under Maintenance). Hit Refresh a couple of times to make sure all is stable. One
   R1-attached device should show, namely PC1 (recognizable by IP address and/or
   name in the table).
10. Turn on R2. Wait about 30 seconds until all its lights are stable.
11. Turn on PC2. All should be well on PC2 (i.e. www.google.com should work).
    NOTE: If this works, congratulations! Your network is basically working. We
    continue to verify functionality and to configure some more settings.
12. From PC2, log in to R2 with URL http://192.168.1.99.
13. In the R2 SMARTWIZARD screen select Attached Devices (under Maintenance).
    Hit Refresh a couple of times to make sure all is stable. Three R2-attached
    devices should show: PC1, PC2, and (name "--") R1 (IP 192.168.44.1).
14. On PC1, in the R1 Attached Devices screen, hit Refresh several times, and verify
    that now three R1-attached devices show: PC1, PC2, and (name "--") R2 (IP
    192.168.44.99).
15. On PC1, log out from R1.
16. On PC2, log into R1 with URL http://192.168.1.1.
17. On PC2, verify again that three devices show: PC1, PC2, and (name "--") R2 (IP
    192.168.44.99).
18. On PC2, log out from R1. Stay logged into R2 for next step.

Step 5. Configure R2, Part 3 (Wireless).

1. In the R2 NETGEAR SMARTWIZARD router manager, select Wireless Settings.
2. Set:
    c. Name (SSID) = NETGEAR (i.e. the same as R1's SSID).
    a. Channel = 6 (Default is 11. In general, pick two different channels for R1 and R2 out of the non-overlapping channels 1,6,or 11).
    b. Under Security Encryption, choose the same method and the same key that are used on R1.
    c. Hit "Apply".
3. Log out of R2.

This completes the basic network setup. It is recommended however to enhance the network experience by moving to static IP addresses. In the case of the NETGEAR routers (I don't know about others), this is a relatively simple procedure and does NOT require changes to your PC setups. I found that if I made changes to the PC setups (through control panel, you can assign it a static IP) the network works fine, except I could not connect to the internet – from any of the computers.

Advantages of static IP addresses are:

1. Each machine (when it is powered on) in your network now has a known IP address and its hard disks (HDs) can be accessed without having to find out what the IP address of each machine is first (on each PC network share the desired HDs: right-click on their icon, select properties, go to the sharing tab, etc.). You can then also map drives to certain letters on other computers, making their access even easier. And yes, you can then even create desktop shortcuts to these HDs …
2. Machines seem to enter the network more quickly after they power on. This makes sense, since the IP address acquisition step is simplified.

A new computer without a static IP reservation that wants to get onto the network (in either wired or wireless manner), can still do so, since DHCP is running and we leave a decent range of addresses open for dynamic assignment (in the wireless case, the security key must be used also on the new computer of course). Since it is simple to set up, there really is no reason not to do this. I describe below the procedure that worked for me.

Step 6. Reserve static local IP addresses.

1. From any of the network PC's, log into R1.
   NOTE: R2's configuration will not need to be changed for this **Step 6**.
2. In the router manager, select Attached Devices. You should see all your network computers, printers (if any), and R2, along with all their IP addresses.
   NOTE: From the network standpoint a PC wired connection represents a different device than the same PC wirelessly connected (different MAC addresses). If a computer can connect wired or wirelessly to the network, two IP addresses should be assigned to its two "devices" (see more below).
3. In the router manager, select LAN IP Setup. Under "Address Reservation" click "Add".
4. A new screen pops up that shows the same set as seen under Attached Devices (if no reservations have been made yet).
5. Click in front of one of the devices (but not R2). Type the desired static IP address.
6. Repeat this for each device (except R2).
7. Since the new IP mapping probably conflicts with part of the current mapping, disconnect all PCs (no need to shut any of them off): On each PC, go to start > run, type "cmd", hit ok, in the console window that pops up – at the command prompt type: ipconfig /release.
8. Reconnect all computers: On each computer, go to start > run, type "cmd", hit ok, in the console window that pops up – at the command prompt type: ipconfig /renew.
9. This process may have to be done piecemeal. For instance, up to now PC1 was connected wired, but perhaps we also want to assign a static IP address to its wireless device. In that case, disconnect the PC1 wired connection. Then connect wirelessly to the network, by enabling PC1's wireless connection. It will show up under Attached Devices, and under LAN IP SETUP we can go through the Address Reservation cycle for this device. For instance, for a certain PC (laptop) in my network, I have wired IP 192.168.44.4 and wireless IP 192.168.44.14 (for generality, I use "1x" for the wireless IP extension if the wired IP extension was "x"). The same device name may show in the table, but the MAC address is different.

After this step, you can access any HD in the network as if it is inside the PC you are currently working on (provided the HDs are shared on the network). For instance, on the PC with IP 192.168.44.4 I can open a regular window (not browser window) and in its address bar type \\192.168.44.2\d. This takes me directly to HD D: on the PC with IP 192.168.44.2. As remarked before Step 6, you can then map often used network HDs and even introduce desktop shortcuts.
NOTE: For working on PC1's HD from PC2, both computers must be powered on. So be sure to set the Power options in each PC's control panel so that remote PCs don't auto shut down in the middle of your work.

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