

# Make This

## Chapter 7 - Networking Behind the Scenes

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After completing some of the previous App Inventor exercises, you probably appreciate the fact that when using an Android device (with the companion app installed) that changes you make to your apps are reflected immediately on your device. In this exercise, we'll take a look at how App Inventor accomplishes this functionality.

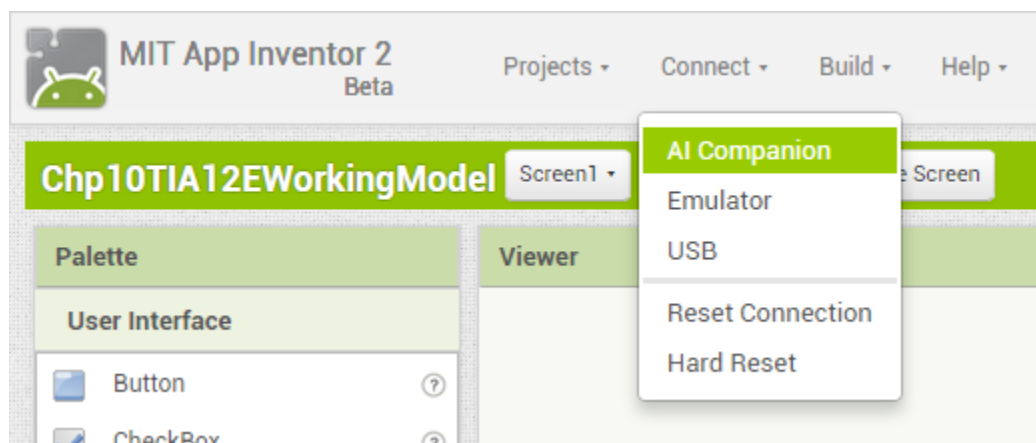
### MIT RendezVous Server

MIT, who created and maintains App Inventor host a web server called the RendezVous Server. One of this server's main functions is to connect App Inventor creators with their mobile devices during the development process. There are a few conditions that must be met first for the RendezVous Server to do its job:

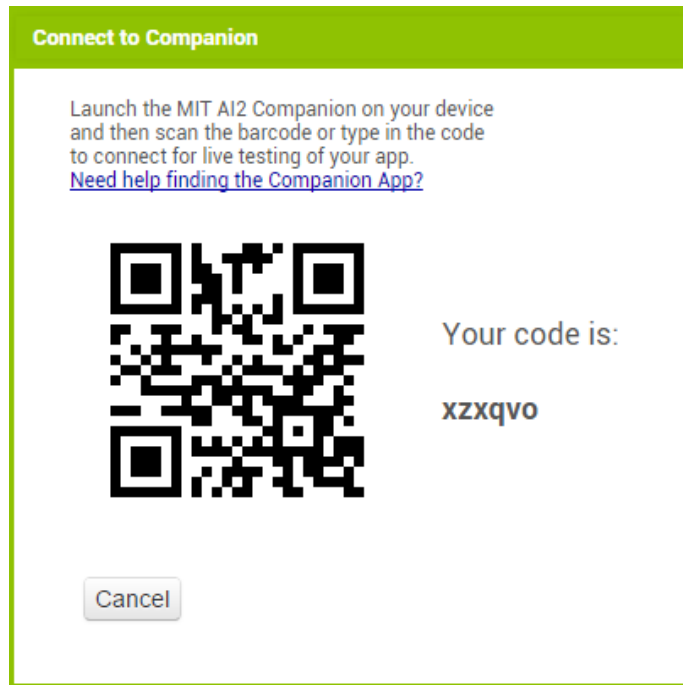
- Both the computer running App Inventor (in the browser) and the Android device must be connected to the same WiFi network.
- The Android device must be using WiFi connectivity and not its cellular provider's data network.
- The latest version of the MIT AICompanion app must be installed on the Android device.

As you learned in Chapter 7, devices connected to the Internet each have their own IP address to facilitate communication with other devices. For App Inventor to connect your computer to your Android device, it needs to know the IP address of both devices. Here's how this happens:

1. In the App Inventor interface (on your computer), you select Connect from the menu and select AI Companion from the drop-down menu (see figure below).

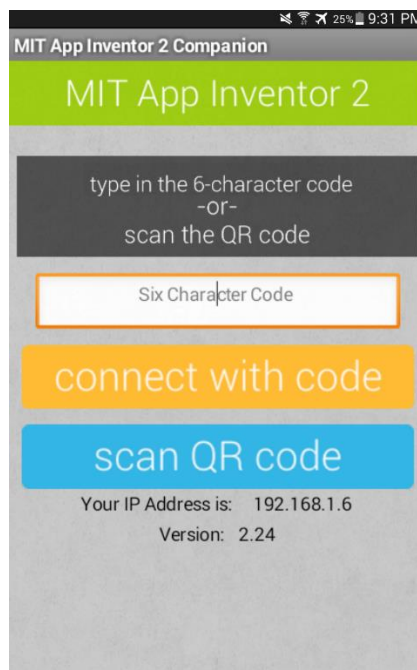


2. App Inventor then sends the IP address of your computer to the RendezVous Server and generates a six character code as shown below:



Your computer's IP address is associated with this code in the RendezVous Server. The server is now waiting for an Android device to contact it using this code.

3. You start the AI Companion app on your android device. Notice that the companion app is recording the IP address of your Android device (shown at the bottom of the app).



4. Once you enter the six character code into the companion app, the app contacts the RendezVous Server and reports the IP address of your Android device. The RendezVous server then tells your computer and your Android device the other device's IP address.
5. Now that your computer and your Android device know each other's IP addresses, they communicate directly with each other over the Internet using the IP protocol.


You've probably found this works fine on a home network. This is because devices on a typical home network are not prevented from establishing communication with each other. In fact, it is extremely useful for devices on your home network to be able to communicate so that they can share data and resources.

### Troubleshooting Connection Issues Using Ping

However, what happens if you try connecting App Inventor with your Android device on a public network, such as the one at your school? Some public networks behave just like your home network, so your Android device should connect happily to your computer. However, many school and corporate networks have additional security in place that prevents cross-device communication. Here are a few things you can try if you are having trouble connecting your devices on a WiFi network (and you can try them even if you can connect your App Inventor devices on your WiFi network!):

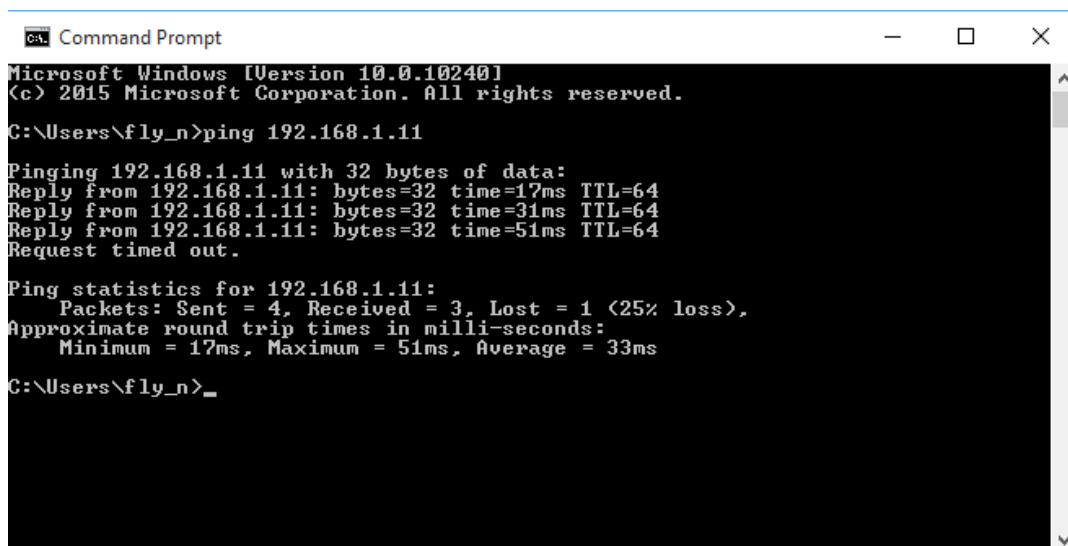
1. **Make sure your computer is connected properly to the Internet** - Paste this link <http://rendezvous.appinventor.mit.edu> into your computer's browser to see if it can reach the MIT RendezVous Server. If you can't reach it, your computer might not be properly connected to the network or the RendezVous Server may be temporarily out of service.
2. **Make sure your Android device is connected properly to the Internet via WiFi** – First, make sure your device is connected via WiFi and not through your provider's cellular service (access the settings screen). Next, go to this link <http://rendezvous.appinventor.mit.edu> in your Android device's browser to see if it can reach the MIT RendezVous Server. If you can't reach it, your Android device might not be properly connected to the network or the RendezVous Server may be temporarily out of service.
3. **Ping Your Android device from Your Computer** – Ping is a utility that is used to test the connection between two devices. A ping tool is built into Windows, OS X and Linux so you can easily see if you can reach another device across a network. To “ping” another device, you need to know its IP address. Fortunately, the AI Companion app reports the IP address of the Android device on which it is running. To ping your Android device from your computer, follow these steps:
  - a. Find the IP address of your Android device on the bottom of the AI Companion app screen. It should look something like this: 192.168.1.11

- b. In Windows 10, type *command prompt* in the Cortana search box. Click (or tap) command prompt in the search results list to launch the command prompt app. The command prompt window will appear as shown below:



```
Microsoft Windows [Version 10.0.10240]
(c) 2015 Microsoft Corporation. All rights reserved.
C:\Users\fly_n>
```

- c. At the prompt type ping and the IP address of your Android device. Then press enter. If your computer successfully “pings” (connects with) your Android device, you should see messages similar to the ones below:

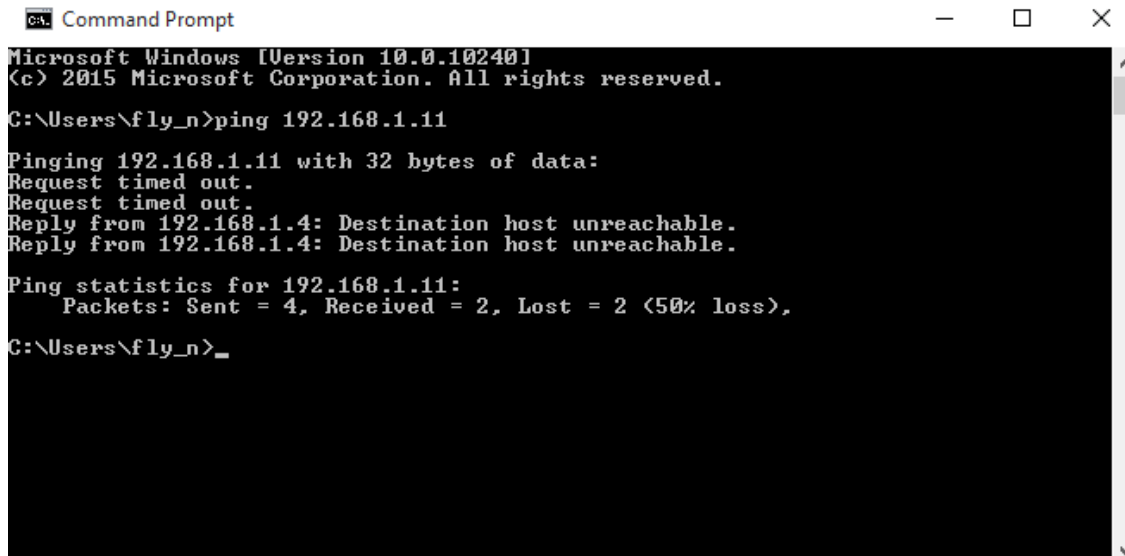


```
Microsoft Windows [Version 10.0.10240]
(c) 2015 Microsoft Corporation. All rights reserved.
C:\Users\fly_n>ping 192.168.1.11

Pinging 192.168.1.11 with 32 bytes of data:
Reply from 192.168.1.11: bytes=32 time=17ms TTL=64
Reply from 192.168.1.11: bytes=32 time=31ms TTL=64
Reply from 192.168.1.11: bytes=32 time=51ms TTL=64
Request timed out.

Ping statistics for 192.168.1.11:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 17ms, Maximum = 51ms, Average = 33ms
C:\Users\fly_n>_
```

The reply messages indicate successful contact of the computer with the Android device. If your computer does not successfully “ping” your Android device, you should see messages similar to these:

A screenshot of a Windows Command Prompt window. The title bar reads "C:\ Command Prompt". The window shows the following text:

```
Microsoft Windows [Version 10.0.10240]
(c) 2015 Microsoft Corporation. All rights reserved.

C:\Users\fly_n>ping 192.168.1.11

Pinging 192.168.1.11 with 32 bytes of data:
Request timed out.
Request timed out.
Reply from 192.168.1.4: Destination host unreachable.
Reply from 192.168.1.4: Destination host unreachable.

Ping statistics for 192.168.1.11:
    Packets: Sent = 4, Received = 2, Lost = 2 (50% loss),

C:\Users\fly_n>
```

In this instance, the computer could not contact the device at IP address 192.168.1.11. It sent data and waited for a reply, but none was received (it timed out...i.e. – got tired of waiting for a response).

To ping using OS X or Linux, check out this link: [How To Ping An IP Address](#)

If the above three steps succeeded and you still can't connect App Inventor to your Android device (via the wireless connection), then most likely there is an internal firewall between the computer and the Android device that is blocking some of the logical ports. As you learned in chapter 7, logical ports are used by computers to exchange information. If some ports that App Inventor needs to communicate with your Android device are blocked, this is most likely why your wireless App Inventor connection isn't working.

Alternatively, the network you are using might be set up to prevent cross-device communication. In either instance, you are working on a network with a high level of security. At this point, having your instructor talk to your IT support staff to see if the problem can be resolved is the best course of action.

### Project Extension - Creating a WiFi Hotspot on Your Computer

On tightly controlled networks, a temporary solution might be achieved by converting your computer into a WiFi router and connect all devices trying to use App Inventor to this new router. Check out these resources if you want to attempt to set up your computer as a WiFi router:

- [How To Turn Windows 10 Into a Wi-Fi Hotspot](#)
- [How To Turn Your Windows 10 PC into a Wi-Fi Hotspot](#)
- [How To Turn Your Mac Into a Wi-Fi Hotspot](#)

MIT App Inventor is a blocks-based programming tool that allows everyone, even novices, to start programming and build fully functional apps for Android devices. Google's Mark Friedman and MIT Professor Hal Abelson co-led the development of App Inventor while Hal was on sabbatical at Google. App Inventor runs as a Web service administered by staff at MIT's Center for Mobile Learning - a collaboration of MIT's Computer Science and Artificial Intelligence Laboratory (CSAIL) and the MIT Media Lab. MIT App Inventor supports a worldwide community of nearly 3 million users representing 195 countries worldwide. App Inventor is an open-source tool that seeks to make both programming and app creation accessible to a wide range of audiences. App Inventor is the property of the Massachusetts Institute of Technology (MIT) and the work licensed under a [Creative Commons Attribution-ShareAlike 3.0 Unported License](#). For more information on App Inventor, go to [MIT App Inventor About Us page](#).