Transmission media is the physical medium that information is sent over. There are two approaches to thinking about transmission: type of path, and form of energy. Type of path can be a copper wire, a radio wave, a fiber optic cable, etc. Form of energy can be a pulse of light, a pulse of electricity, or an electromagnetic wave (radio).

Copper-wire connections need, at the very least, two wires. One sends a message to the server, and the other receives a message from the server. The two wires are each insulated with plastic so that their signals do not interact; these two insulated wires are wrapped with plastic again, to keep them together. A copper wire is a quick and effective way to send information, but other EM waves (like the waves given off by fluorescent lights) can interact with the copper and create interference, causing them to send conflicting signals.

- Twisting two wires together will prevent a large amount of interference; it causes the wires to take on equal amounts of EM radiation, which makes the interference signals cancel out. This method is useful, but can cause problems when exposed to very high sources of interference or when using very high frequency signals.
- Encompassing twisted cables in a metal mesh will block most interference. This is effective, but expensive.

Fiber optic cables are one single, thin strand of glass. This glass is heavily insulated with another layer of glass and wires for strength; due to the properties of the glass, shining a light into one end of the cable will cause the light to reappear at the other end.
Fiber optics are immune to EM interference and can transmit information much faster than copper wire, but are also much more expensive than copper wire, and much more fragile, as well.

InfraRed communication is a short-range light-based communication. It is most commonly used for TV remotes and similar close-range technologies. Something as thin as a smooth sheet of paper can block an IR signal; additionally, IR signals transmit very little data, the fastest being just 4 Mbps. (Compare to Clemson's internet speed, which is around 200 Mbps at peak performance: about 50 times faster.)

Point-to-point communications are light-based connections that can be used to send close-ranged information. They are difficult to set up and maintain, and are typically used within close-range applications, such as between two nearby buildings. These are created with laser lights that transmit from a sender to a receiver, as long as the two have a direct line of sight.

Electromagnetic (radio) communication is the most common form of wireless communication. It is extremely long-range and can penetrate through walls, allowing it to be used extensively for many purposes. However, the properties of the radio wave change with the frequency; for this reason, the FCC (a United States government body) regulates the use of some radio frequencies.
Low-frequency radio waves will actually follow the earth's curvature; they transmit well over flat surfaces, but can be blocked by uneven ground. Low-frequency waves transmit information at less than 2 Mbps. Medium-frequency waves transmit between 2-30 Mbps and can be bounced off of the atmosphere, especially the ionosphere. Transmitting above 30 Mbps will result in the signal traveling in a straight line, requiring satellites to retransmit it.

Satellites fall into three categories: low earth orbit, medium earth orbit, and geostationary earth orbit.

- Geostationary satellites are around 35,000 km away. Geostationary satellites match Earth's spin speed; this means that they will always be pointing at the same spot on the ground.
    - This has the advantage that a ground transmission system, once built under the satellite, never has to be moved again.
    - This has the disadvantage that the satellite is very far away. Even at the speed of light, it takes about .2 seconds for the satellite to receive and send a signal.
    - Only 3 geostationary satellites are needed to cover the whole earth, since each can cover about 120 degrees of the surface. Because they must be spaced apart to prevent interference, only around 45-90 can exist at any one time.
- Low earth orbit satellites are around 500 km away from the surface. They orbit earth at high speed. A cluster of satellites orbit around the earth in order to make sure that when one satellite moves out of range, the other satellite can pick up the signal it used to be receiving.
    - This has the advantage that transmission lag is very small, only about .01 to .04 seconds.
    - This has the disadvantage that ground receivers must be able to rotate to follow orbiting satellites, and that several satellites must be in orbit.
    - A "cluster" is an evenly-spaced ring of satellites around the planet, as opposed to a swarm of satellites moving as one big blob.

There are two important measures of how good a transmission medium is: the propagation delay, which is the time the signal takes to traverse its medium, and the channel bandwidth, how much information can be transmitted on one channel.

Nyquist's theorem calculates bandwidth and transmission time to give the maximum theoretical transmission speed over a channel. In practice, the maximum bandwidth can never be achieved, because there will always be some interference.

Shannon's theorem improves on Nyquist's theorem. It factors in environmental noise to give the actual amount of bandwidth that can be used.

The signal-to-noise ratio (usually measured in decibels, dB) is used to indicate how effectively a signal makes it to its location. The decibels are measured as: 10*log(10)(p2/p1). In this equation, P is "power". P2 is the power of the signal that carries information we want, and P1 is the power of the interfering noise. If the log function is positive, it means the power of the signal was stronger than the power of the interference. This means the overall transmission was amplified. If the log function is negative, it means the power of the noise was stronger than the power of the signal, and the overall transmission was reduced.