

Although it may seem unimportant, a delay of approximately 0.2 seconds can be significant for some applications. In a telephone call or a video teleconference, a human can notice a 0.2 second delay. For electronic transactions such as a stock exchange offering a limited set of bonds, delaying an offer by 0.2 seconds may mean the difference between a successful and unsuccessful offer. To summarize:

Even at the speed of light, a signal takes more than 0.2 seconds to travel from a ground station to a GEO satellite and back to another ground station.

7.17 GEO Coverage Of The Earth

How many GEO communication satellites are possible? Interestingly, there is a limited amount of “space” available in the geosynchronous orbit above the equator because communication satellites using a given frequency must be separated from one another to avoid interference. The minimum separation depends on the power of the transmitters, but may require an angular separation of between 4 and 8 degrees. Thus, without further refinements, the entire 360-degree circle above the equator can only hold 45 to 90 satellites.

What is the minimum number of satellites needed to cover the earth? Three. To see why, consider Figure 7.13, which illustrates the earth with three GEO satellites positioned around the equator with 120° separation. The figure illustrates how the signals from the three satellites cover the circumference. In the figure, the size of the earth and the distance of the satellites are drawn to scale.

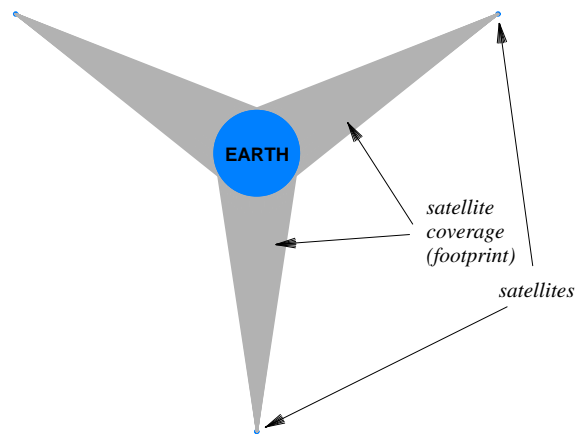


Figure 7.13 The signals from three GEO satellites are sufficient to cover the earth.