

## What is Bandwidth?

**Bandwidth** is the amount of information that can be carried in a given time period (usually a second) over a wired or wireless communication link. In digital systems, bandwidth is expressed as bits per second (bps). The higher the bandwidth, the more data can be transferred in bits per second.

## Bandwidth Units of Measurement

In digital systems, bandwidth is expressed as bits (of data) per second (bps). Here are the units of measure for bandwidth or data transfer speeds:

bit= smallest unit of digital information (ones and zeros)

byte= a set of 8 bits

bps= bits per second

Kbps= kilobits per second =1000 bits per second

Mbps = Million bits per second =1,000,000 bits per second

Gbps = Gigabits per second = 1,000,000,000 (one billion) bits per second

Tbps = Terabits per second = 1,000,000,000,000 (one trillion) bits per second

## Connection Speed Requirements

- Most PLATO courseware requires an average minimum connection speed of **40 Kbps**
- PLATO Life Science courseware requires a **128 Kbps** minimum connection speed

Before you have students connect to PLATO Learning web products from home, find out if they have a dialup modem. Analog, dialup modems utilize nearly the full bandwidth of the present day phone system. A speed of 33.6 Kbps is pushing the speed limit of the current analog phone system. Most users with a 33.6K or 56K modem will never achieve a connection rate of 40 Kbps due to phone line conditions. Many phone connections do not support speeds higher than 28.8 Kbps, which is not fast enough to run PLATO courseware. For these reasons, students who are home users may need a DSL or cable Internet connection instead of a dialup modem to run PLATO courseware. DSL and cable Internet connections are capable of much higher data transmission speeds than a modem and telephone line

## Available Bandwidth

You must determine your **available bandwidth** for PLATO Learning software. You may have a T-1 line, but if it's currently 50% utilized, you only have 772 Kbps to run PLATO software. For more info, see *Bandwidth - How Much is Enough?*, a white paper you can download from <http://support.plato.com/accountability/pwln.asp#papers>.

## Bandwidth Requirements for Concurrent Users

# of Users	Minimum Requirements	Connection type
25	750 Kbps	Half T-1 line
50	1.5 Mbps	Full T-1 line
75	2.25 Mbps	Full T-1 and half T-1 lines
100	3 Mbps	Two full T-1 lines
125	3.75 Mbps	Two full and one half T-1 lines
150	4.5 Mbps	Three full T-1 lines
175	5.25 Mbps	Three full and one half T-1 lines
200	6 Mbps	Four full T-1 or one DS-2 line
500	15 Mbps	10 full t-1 lines

## Bandwidth Calculators

To convert a bandwidth unit of measurement into equivalent units of measurement: <http://support.plato.com/26959>

To determine how long it will take to download or transfer a file: <http://www.bandwidth.com/tools/fileTimeCalc>

## Connection Speeds and Types

Speed	Connection type
155.52 Mbps	OC-3, STS-3
100.0 Mbps	<a href="#">CDDI</a> , <a href="#">FDDI</a> , <a href="#">Fast Ethernet</a> , <a href="#">Category 5 cable</a>
51.84 Mbps	OC-1, STS-1
44.736 Mbps	<a href="#">T-3</a> , DS-3 North America
34.368 Mbps	E-3 Europe
20.0 Mbps	Category 4 cable
16.0 Mbps	Fast Token Ring LANs
10.0 Mbps	<a href="#">Thin Ethernet</a> , category 3 cable, <a href="#">cable modem</a>
8.448 Mbps	E-2 Europe
6.312 Mbps	T-2, DS-2 North America
6.144 Mbps	Standard ADSL downstream
4.0 Mbps	<a href="#">Token Ring</a> LANs
3.152 Mbps	DS-1c
2.048 Mbps	E-1, DS-1 Europe
1.544 Mbps	<a href="#">ADSL</a> , <a href="#">T-1</a> , DS-1 North America
128 Kbps	<a href="#">ISDN</a>
64.0 Kbps	DS-0, pulse code modulation
56.0 Kbps	56flex, U.S. Robotics x2 modems,
33.6 Kbps	56flex, x2 modem communications rate

## Speed and Traffic Tests

Find out how fast your Internet connection is:  
<http://www.numion.com/YourSpeed/>

If the Internet has slowed down, find out if the problem is global or local by checking the Internet Traffic Report:  
<http://www.internettrafficreport.com/main.htm>

Use NetStat Live from AnalogX to monitor your throughput for incoming and outgoing data:  
<http://www.analogx.com/contents/download/network/nsl.htm>

## Contact Us

To schedule onsite technical services from a certified PLATO Learning Field Engineer:

- Phone: 800.44.PLATO
- Email: [info@plato.com](mailto:info@plato.com)

To contact PLATO Support Services:

- Phone: 800-869-2200
- Email: <http://support.plato.com/email>
- Support site: <http://support.plato.com>