Understanding the Benefits Wireless & Wired Networks

Sony Virtuoso™ Language Learning Software provides a highly functional, unique, interactive technology solution for teaching and learning both spoken and visual languages. Listening, speaking, reading and writing exercises can be conducted individually, in pairs or in groups.

The teacher can send multimedia lesson files (video, audio, text) to students and the students can be paired up for speaking and listening activities. This is just one example of the advanced interactivity that the software can provide over a standard computer network without the need for any proprietary hardware.

Wired Vs. Wireless

Many schools and institutions utilize wireless and wired networks. One question people often ask is: "Which is better, a wired network or a wireless network?" The answer is that they should be viewed as complementary technologies as both have their advantages and disadvantages. The most significant benefit of wireless networks is they are convenient, especially for low bandwidth use. However, for higher bandwidth applications, wired networks offer many advantages.

Will the Sony Virtuoso software operate in a wireless network environment? The answer comes with understanding the functionality of the Sony Virtuoso™ software, how it operates and how wireless networks differ from a wired network connection.

How does Sony Virtuoso software operate over the network?

If you consider how most computers (desktops or student laptops/tablets) use a network, it is fairly simple. Primarily users are either accessing the internet or accessing a file on a network folder. **Normally student computers themselves never need to communicate with each other.**

Communication: Sony Virtuoso software makes use of the network in distinct ways due to the unique functionality of the software (designed specifically for teaching languages). For example, when two students are paired together for a speaking & listening exercise, both computers will be "communicating" with each other over the network. When you pair up an entire class then all the computers are "communicating" with the other computers. **This "one-to-one," "one-to-many" and "many-to-many" communication makes the software extremely effective for language teaching. It is unique to effective language teaching technology.**

Voice: In addition, when two students are talking to each other, it is important that the latency (or delay) between their voices is negligible. To achieve this, a fast, stable network is required so that communication is as natural as possible. Everyone has experienced mobile phone dropouts or delays when calling long distance. This is annoying and very disruptive. It would be unacceptable to have this kind of audio dropout or delay during language practice.

File Sharing: Another factor to consider is the opening of files and saving of recordings. The teacher can "send" a multimedia file to all students. When this occurs, all of the student computers will "hit" the server at once to copy and open a file. This places a load on the network.

Conversely, when a teacher saves all students recordings, the network has to be able to handle multiple file copies occurring at the same time.

All of the above scenarios can easily be handled by a traditional wired network. Wireless networks do not have the data speed (throughput) to equal a wired network so it is necessary to evaluate wireless performance.

Wireless in an Education Environment

In a home environment, a wireless access point is able to handle your laptop and phone and provide acceptable bandwidth. However, an education environment is one of the toughest places to integrate a wireless solution. The main reason is the large number of wireless devices contending with each other for the available bandwidth.

With many schools moving to a 1:1 laptop (or tablet) to student ratio, schools have to provide bandwidth to a very large number of students. Many universities have addressed this issue by providing both wireless access for convenience and wired networks for greater bandwidth and speed.

When computers are connected to a wired network, they are given full, unrestricted bandwidth. This cable goes straight into a network switch which manages the bandwidth for all users. Wired networks can handle a large number of users simultaneously and provide users with consistently fast network speeds.

> The University of California (UCLA) advises students on its website: "The wireless network is not meant to replace the wired network, rather it is provided as a convenience and provides overlay with the wired network. The STC (Student Technology Center) recommends students use a wired connection when possible as it provides a faster, more reliable and secure connection than a wireless connection." Source: UCLA portal Article ID: 1003604

By contrast, a wireless user has to deal with a number of issues. The wireless access point that students connect to is also connected to the same network switch that a wired user is plugged into.

A wired network provides continuously high bandwidth, whereas the wireless user has the following challenges:

Even with one wireless user connected to the access point, they will receive far less bandwidth than the wired user. The theoretical published bandwidth for wireless devices is almost never reached in real-world conditions.

In a school environment there may be many laptops connected to a single access point. Consider the access point as a traffic jam where multiple users must pass through this device before getting to the network switch. By contrast in a wired environment each user plugs directly into the network switch bypassing this traffic jam.

Interference plays a big part in day-to-day wireless use. This wireless radio interference results in lost packets of data which must be re-transmitted causing a slower connection speed and a delay in delivery of information to the student. Careful access point placement and network design can help, but does not necessarily eliminate the problem.

Variable performance: Laptops competing for available access points will vary at any time and this performance is not easily controlled, resulting in different network speeds (good one day and poor the next).

Lost data: Wireless networks will more likely lose data meaning audio can "drop-out," similar to what we all experience from time to time with mobile phones. This becomes a serious issue when dealing with voice communications, especially in a language learning environment. Wired networks, however, provide very reliable voice communications over IP.

Sony Virtuoso Software and Wireless Networks

With normal student use of the wireless network, they are all requesting the wireless access point to send them internet information at different times. This is "non-time critical data," meaning that if the web page takes a bit longer to load than it did yesterday it is not necessarily disruptive.

The point to note with the Sony Virtuoso™ software solution is that certain critical functions, such as audio student pairing, will require all student laptops or PC's to send their voice (VoIP) data to the access point which then travels into the network switch, then back again to the same access point to be broadcast to the student's partners (this data is contended by the Wireless Access Point).

So for a 30 student audio pairing situation, the access point needs to be able to broadcast all 30 streams without interruptions to avoid any audio dropouts or latency. If you picture 30 audio streams going into the access points, then the same 30 audio streams going back out of the access point, it is easy to see why current wireless technology will struggle to give you a high-quality speaking environment that is free from any dropouts or delay.

The above listed issues will also affect normal internet access. However, when computers have to talk to other computers on the network then the access point is severely "choked." Consider what happens when two users are connected to the same access point. If one student is paired with the other student to talk, then their voice has to go into the access point, travel to the network switch, then go back to the same access point before wirelessly connecting to the other student. The potential for network dropouts is significant because the wireless environment is uncontrolled and variable. The signal is also subject to interference and variability (how far are you physically from the access point; are other users trying to use the same frequency; how many users are connected to the same access point). This is a very challenging environment when the network needs to be reliable.

⚡ Network Speed: The FACTS

In computing, data transfer rate is the average number of bits per unit time passing between equipment in a data network. In wireless and wired networks, it is normally measured in megabits per second (Mbit/s) or gigabits per second (Gbit/s).

Network Speed Compared

Wired:
Minimum 100 Mbit/s
Maximum 1000 Mbit/s

Wireless:
Wireless "G" = 54 Mbit/s (published)
Wireless "N" = 108 Mbit/s (published)

At best you might get 75% throughput performance, **therefore the best speed that is SHARED between all students is likely to be**:

Wireless "G" = 40.5 Mbit/s
Wireless "N" = 81 Mbit/s

ℹ Classroom Example

Assuming a **30-seat Language Classroom**, the following is the network speed experienced by the students:

Wireless "G" = 1.35 Mbit/s per student laptop

Wireless "N" = 2.7 Mbit/s per student laptop

Wired = 100 Mbit/s or 1000 Mbit/s per student laptop

Therefore, if a wireless network is being considered for a Digital Language Lab, a robust and reliable wireless network that can provide the appropriate network speed is required.

Conclusion

Language Labs are invaluable for teaching and learning languages in the 21st Century. No other technology solution comes close to providing the features and functionality demanded by language teachers the world over. The unique benefits that Sony Virtuoso™ software brings to students and teachers cannot be debated. After all, it's all about creating better listeners and speakers of the target language and improving results. For this reason, schools and universities that want the best language learning technology for their programs continue to invest in Language Lab solutions.

The convenience of wireless networks is indispensable for 21st century computer devices. However, there are still many applications, including Digital Language Labs, that require a robust and reliable network due to the current limitations of wireless technology. Wireless technology continues to improve but it is still inferior to cables when considering reliability and scalability.