ETC 647 – Creating Technical Learning Environments
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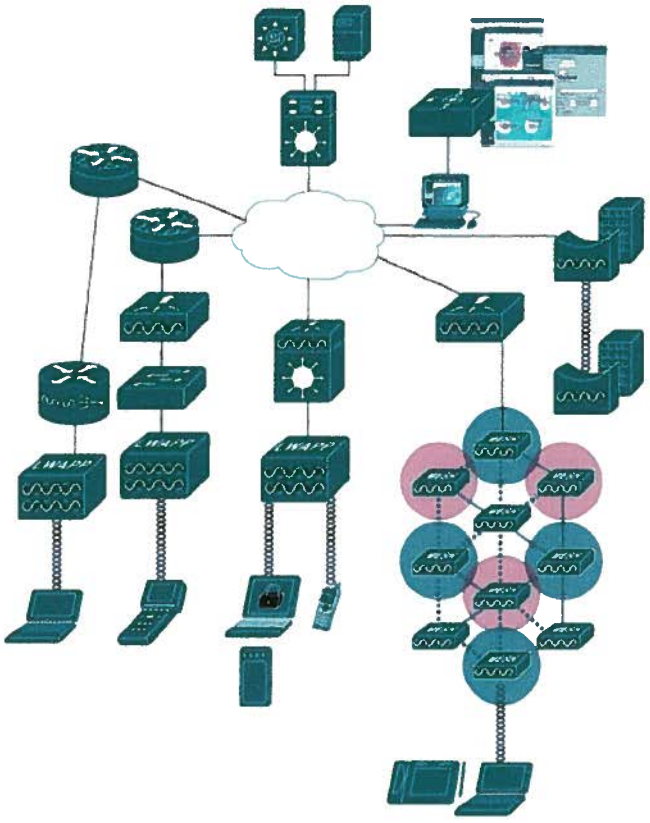
Melody Buckner
Future Trends



Unified Advanced Services
Unified Wi-Fi VoIP, advanced threat detection, identity networking, location-based security, asset tracking, and guest access.

World-Class Network Management
Same level of security, scalability, reliability, ease of deployment, and management for wireless LANs as wired LANs.

Network Unification
Secure innovative WLAN controllers. Integration into selected switching and routing platforms.

Mobility Platform
Ubiquitous network access in indoor and outdoor environments. Enhanced productivity. Proven platform with large install base and 61% market share. Plug and play.

Client Devices
90% of Wi-Fi silicon is Cisco Compatible Certified. Proven Aironet platform. "Out-of-the-Box" wireless security.

Cisco Unified Wireless Network Elements Work Together to Deliver a Unified Enterprise-Class Wireless Solution

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The original network that I outlined was a computer lab for the new NAU campus in Tucson, Arizona. I want to explore some new trends for this college campus.

I started by talking with the head of IT at Pima Community College Northwest Campus. I asked him about his thoughts on wireless networks for college communities. Pima Northwest has been set up for wireless access throughout the whole campus since they opened in Fall of 2003. He was very optimist and positive about their experience. He talked to me about the wireless network and some security issues with solutions.

After this conversation I decided that the new NAU campus would benefit from allowing students to access the Internet by a wireless network.

Wireless Networking

1) The basic knowledge of the new technology

Here are some key concepts about wireless networks:

a) A wireless network is sometimes referred to as a WLAN for Wireless Local Area Network. The term Wi-Fi is also used to identify a wireless network.

b) There are several ways that wireless networks transport data, they are: RF signals (radio signals), microwaves, communications satellites and infrared light. The most common for LANs is the RF signals.

c) There are several forms of wireless networks, but the most popular is wireless Ethernet. The wireless standard that is used is 802.11. There are two versions of this standard 802.11a and 802.11b. The original standard is the 802.11b. The more expensive of these two is 802.11a and it is faster (54Mbps) and more reliable. The frequency of the 802.11a is 5Ghz, the frequency of the 802.11b is 2.4Ghz.You are not able to mix the 802.11a and the 802.11b in a network. Most small businesses and schools choose the 802.11b (11Mbps). Pima Community College uses the 802.11b standard. There is also a 802.11g that tries to combine the best of both 802.11a and 802.11b.

d) Each computer that belongs to a single wireless network must have the same SSID or Service Set Identifiers.

e) Since wireless networks can transmit over many channels the computers on the network must operate on the same channel.

f) The computers on the wireless network can be connected to an existing cabled network through a device called a WAP or Wireless Access Point. The WAP is basically a box with an antenna and a RJ-45 Ethernet port. So just plug the WAP into the cable network and the other end into a hub or switch.

g) Each computer that will be connected to the wireless network will need a wireless network adapter (this is similar to an NIC). There are several types of these adapters. For a desktop you install a wireless PCI card. For a laptop there is a wireless USB adapter or a wireless PC card that fits into the PC card slot.

2) The impact on the network of the new technology

The current network will operate using standard Ethernet technology. I do not plan on changing the current Ethernet network configuration. What I will propose is adding onto the current network wireless capabilities.

With a wireless network there would be no need for students to connect to the network with cables. Instead the wireless network will use radio waves to send and receive any network signals. With the 802.11b standard the maximum range will only be about 300 feet, but this is very optimist. Basically, the network will also slow down the further the student gets away the WAP.

This leads me to discuss some disadvantages to the wireless network. One is slow transmission, another is interference and the biggest problem to deal with is security. Then, of course, there is the cost of installing and maintaining a wireless network.

Since the security issue will be a major problem with deans and administrators, I will address this first. There were two suggestions that my IT expert recommended to me. The first is to block wireless access from the universities internal network and simply allow access straight out to the Internet. Most students will not need access to the universities network. They just want out on the "Superhighway". The faculty and staff can gain access the internal network with secured ID's and passwords. The second recommendation is to use software called TippingPoint. The TippingPoint IPS is an in-line device that is inserted seamlessly and transparently into the network. As packets pass through the IPS, they are fully inspected to determine whether they are legitimate or malicious. This instantaneous form of protection is the most effective means of preventing attacks from ever reaching their targets. To read more about this software, you can go to:

http://www.tippingpoint.com

The next issue that will have to be overcome is funding for the equipment, installation and maintenance of a wireless network. Well, the computer lab is being set up this month, so the installation cost could be covered in the initial setup. The items that will be need include with price:

Item	Cost
NIC for each computer (only necessary for NAU employees)	$125 each
WAP (Wireless Access Point), more than likely from Cisco since all other devices are Cisco.	$300 to $2,000
Access Controls for "Hot Spots"	$6,000
Security (TippingPoint)	$25,000

3) The impact on current learning environment

I do not plan on changing the current Ethernet network configuration, of the computer lab, it will still be available for students. They will be able to bring their files stored on USB drives, CDs and floppies and access the Internet on the lab computers.

However, with the new wireless capabilities the students will be able to bring in their laptops and access the Internet anywhere in the building. This will add convenience and flexibility for students, faculty and staff. In the classrooms, they will be able to access the Internet without wires. Integrating technology into the classroom will be seamless. If a student or faculty member brings their own computer into the classroom they will be able to jump right on the Internet without jumping through hoops. This may encourage faculty to use the Internet more in lectures and classroom assignments. No longer will the class have to do research outside of class or in the computer lab. They will have direct access during class.

4) Vision of possible impact on future learning environment

The biggest impact on adding wireless networking to a college campus is convenience. As stated above, students can bring in their own laptops and access the Internet. There will be several faculty offices located on this site, so faculty and staff would also be able to connect to the wireless network with their own personal computers.

Maybe in the future the university will be able to allow students to access to the school network and let them use software licensed for classroom instruction.

Another future trend that I would like to see happen at every level of education is e-books. Publishers would probably shoot me, because they make tons of money on college students' who purchase these massive books to lug around, but I am ready for e-books. It would be great to just take your e-book or notebook to the bookstore and have them load the textbook or better yet download it from the Internet via the wireless connection. And for public schools each child would have an e-book loaded with current subject matter. My son in fifth grade carries home 3 to 4 books a night and one of them is 30 years old! Let's catch up with the times! Sorry, I will get off my soapbox.

5) The presentation: complete, accurate, and convincing

A Power Point Presentation will be attached along with this document detailing the network changes and how the changes will improve the learning environment now and in the future.