Now You See it, Now You Don't:

Using WiFi Laptops to Turn a Meeting Room into a Classroom

Michael J. Dargan, MLS, March 19, 2009

It's a great honor to be asked to be talk. I've always been impressed by the quality of these conferences; we're very fortunate to have Ron Joslin in charge.

Don't be afraid to butt in with questions as I go along. I'm not worried about losing my place; if I run out of time, I'll post the presentation and remarks on line.

What I have for you today is mostly a series of anecdotes which, I hope, will tell the story of our attempt to get the most out of our limited space.

First, a little about me:

I'm the Technical Systems Administrator for the Waterloo and Cedar Falls Public Libraries. Since 2006 I've also be head of Reference and Adult Collection Management.

Prior to that I spent most of a decade at the University of Northern Iowa teaching English and working in the Center for the Enhancement of Teaching.

Prior to that, I raised corn and beans, hogs and cattle, in Black Hawk

I have the good fortune to work for two libraries: Cedar Falls, which owns a 5 year-old structure designed as a library from the ground up, and

Waterloo Public Library

Waterloo, which lives in an old U.S. Post Office building of New Deal vintage.   Both libraries do a considerable amount of public access computer traffic, about 120,000 sessions a year. Both libraries have patrons with widely and wildly differing levels of computer competence.

As our librarians raced around from station to station attempting help patrons create resumes, do school assignments, create email accounts, find mates, apply for jobs, etc., it became clear to us that it would be more efficient to teach in a more traditional, classroom, setting.

Both libraries include "life long learning and literacy" in their mission statements.

Crowded original WPL Training Room

I first broached the idea of training rooms in 2006 and spent some time informally pitching the idea. Waterloo moved along more quickly as we have a professional trainer on staff who was already conducting classes in a former staff workroom into which 9 computers and an over head projector had been crammed.

It was hot, cumbersome, and if it didn't violate a fire code or two it probably should have. Another drawback to the setup was that when not in use for training, the equipment was part of our Pharos Signup/Uniprint controlled public access computer pool.

When used for teaching purposes our other patrons had to stand in line. Moreover, the teachers and students found having to work around the security and software limitations of PACs, cumbersome.

Cedar Falls PL AV Cart

For five years the CFPL limped along with a an INFOCUS 540, some old Altec Lansing speakers, and an HP Pavilion P3 computer. Hard to see around, generally unreliable. Poor sound, no DVD/VHS capability. Did use 802.11g WiFi.

Opening of WPL BHCGA Training Center

So, the trainer applied for a $50,000 grant from the Black Hawk County Gaming Association, an entity created to supervise the distribution of a portion of the profits from a local casino.

The grant called for the replacement of the existing room. We got the money, found that we needed even more money to comply with building codes (HVAC, Ethernet, and electrical upgrades), decided to use money intended for carpeting to complete the task.

We ended up with an 18 seat room with overhead projector. All computers were conventional towers on a Cat 6 Ethernet network. We now do about 30 classes a month and are limited by a lack of instructors.

WPL Training in March 2009

We're packing them in. We post the schedules in the last week of the month and they're usually full with waiting lists before the first class is taught.

Cedar Falls PL Meeting Room

A dedicated room with fixed equipment made sense in Waterloo. In Waterloo, our 60,000' building has space that can be devoted to a fixed computer lab. Cedar Falls, on the other hand, has a new 43,000' building that is pretty much full and is growing rapidly. There's no space for a dedicated classroom and dedicating our public meeting room to instruction was not about to happen. Nonetheless, Cedar Falls also had a real need for a solution to its own training needs that would allow us to have our cake and eat it too.

Cabling Nightmare!

One day, while on a road trip with my wife, who is an experienced computer lab teacher, we did some brainstorming. Right from the start, we figured that laptops would be the way to go. I knew that the State Library of Iowa had a portable computer lab with WiFi networking.

However, I had not looked at it closely. What I did know was that every laptop had its own carrying case and that they had a bag filled with a rat's nest of cables, power strips, AC/adapters, an LCD projector, and other miscellaneous bits and pieces.

That approach did not appeal to me. The State Library could control who used the setup and could ensure that it would only be used by their staff. I wanted something that fairly naive users could start up and shut down with minimal intervention from trained staff. I also wanted to see a system that would allow us to retain use of our large meeting room for other activities.

If you don't think too good, don't think too much!

With all that in mind, we quickly made a list of what we needed to create a training room that ordinary users could reliably setup and tear down quickly and easily. By the time we were home, here's what we had:
laptop computers
Web cams
Physical Security
Quick, secure, storage
Internet Access
MS Office Suite
Operational Stability
Printing
Ceiling mounted LCD projector
Instructors
And, of course, everything had to comply with the famous admonition of baseball great Ted Williams: "If you don't think too good, try to not think too much!"

Inspiration: Create a laptop classroom!

Shortly after this exercise we had a management planning meeting in Cedar Falls where once again our lack of a proper training facility was discussed.

I briefly mentioned the laptop lab idea and the next thing I knew, a laptop lab was one of my goals for FY2008! Since the Black Hawk County Gaming Association had willingly funded the Waterloo project, we decided that Cedar Falls should go back to the well.

Frankly, an entire conference session could be devoted to the process of creating a grant application and getting it blessed by the various city government people.

Luckily, the idea caught the imagination of my board of trustees and my boss, the director, who was very effective at selling the plan to city hall.
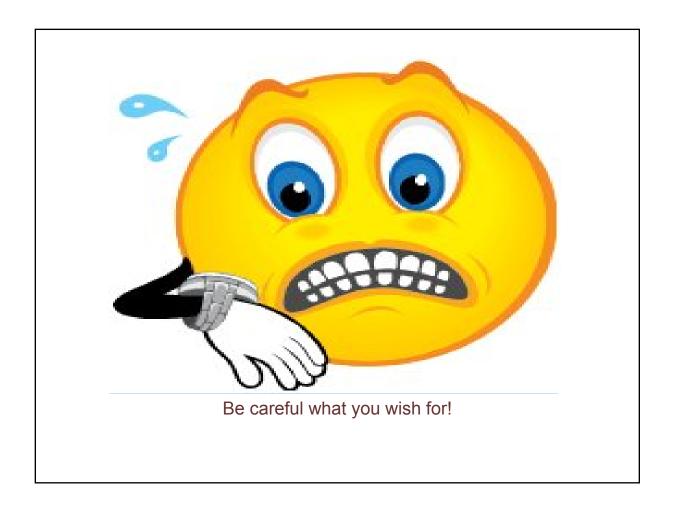
Good ideas draw money.

The application was submitted in late March, and in early June we got good news and bad news: The good news was that the BHCGA granted us $30,000 for the project; the bad news was that the budget called for $61,000.

My first thought was relief: I could cut the size of the project in half and not have to work so hard! However, I had underestimated my board's enthusiasm for the project: within a few weeks applications for the balance were submitted to the community foundation, the friends of the library, and it was decided that the proceeds from a bequest intended for programming would be directed at funding stipends for trainers.
 For the first two years it looks like I have about $84,000 pointed at the project. Some of the additional money was used to install an LCD projector with speaker in the ceiling of the meeting room.

Be careful what you wish for!

So, I was stuck with having to actually do something.
Major worries:
Electrical power for the laptops
Battery charging
Internet access: Capacity, bandwidth, LAN security, stability
Pointing devices (mice)
Printing
Physical security of equipment (box and GPS)
Getting away from remote controls
Installing and maintaining software
Warranty
Statistics
AUP
Instructors

Dell Latitude E5500

Until starting this project my major experience with laptop labs had been with the State Library. As I said earlier, they carried their 12 notebooks like luggage and had these bags of power strips and drop cords that they had to untangle, plug in, then tape down.

What a mess. I feared that with 24 laptops with 24 power adapters and 6-8 power strips we'd spend as much time setting up and tearing down trip hazards as we would actually using the equipment.
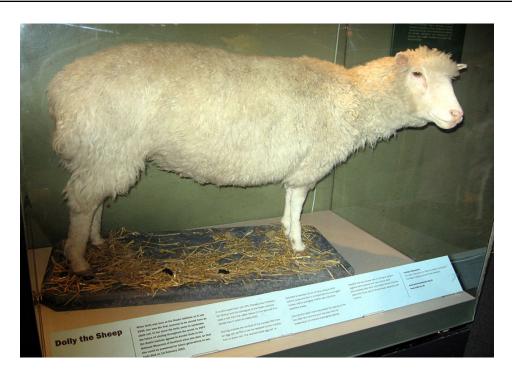
And, it gets worse. You want these laptops to be charging in the cart between sessions. Imagine having to pull 24 chargers out of the confined space of a cart each time you wanted to use them. And, afterwards, you'd spend an hour shucking the skin from your knuckles threading the cables and feeling around for plugs and outlets. it sounded dangerous, cumbersome, and a serious impediment to use. My first thought was to buy extra power adapters at $90 each.

Big Batteries Make Life Easier!

However, I could not bear the thought of spending $2500 on what would be an electrician's nightmare.

The solution? I bought the notebooks with the extra large 9 cell batteries. The cost was about $85 each and run time is somewhere between 2 and 7 hours. Right now, I predict that in most cases our class users should be good for about 3-4 hours--well beyond the typical 75 minute class that we're planning.

An added advantage is that, when fully charged, the laptops can be cloned on battery power. The manufacturer claims that the batteries are good for 300 charge/discharge cycles. If they start to fail a couple of years from now, we'll just buy new or refurbished batteries and call it maintenance. Sounds like a cheap way to get lots of utility.
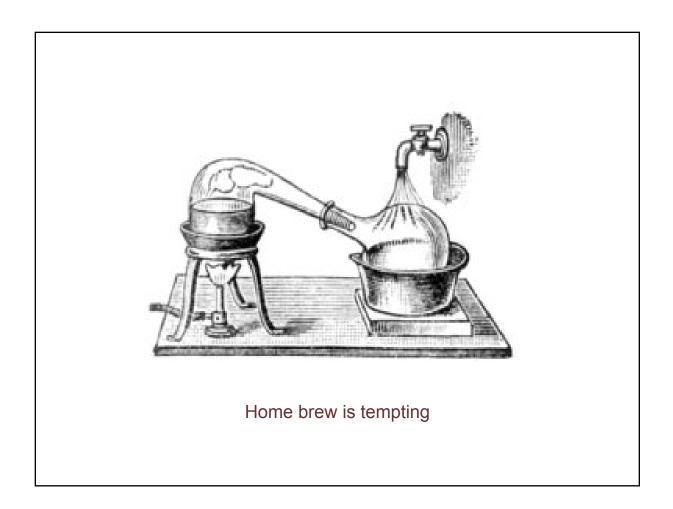
Cloning: It's not just for lamb chops!

Right from the beginning I had planned on cloning the laptops. Manually configuring and installing software on 24 computers would take a huge amount of time, they'd all be different, and I'd be unwilling to make changes due to the huge investment of time.

I have some experience with Symantec Ghost Solution Suite and had hoped that I would be able to set a 26 port switch on the cart, cut a bunch of Cat 5e patch cables, and clone the whole bunch at once.
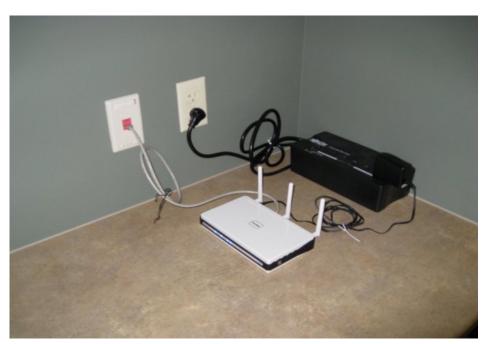
 In theory, this could be done, and I expect to figure it out someday soon. However, for right now I set 12 at a time on my counter, plug them into a switch, and clone them using PXE boot to a Linux disk image on a TFTP server (TFTP32) and manually log each computer onto the Ghost Server session. Takes me about an hour and 20 minutes to do 12. I can live with that.

Home brew is tempting

Cloning is fairly straightforward, but putting 25 computers on the network using WiFi posed other issues: I've been a small scale user of WiFi APs for about 5 years. However, I've never done anything with this many boxes and was concerned about reliability, ease of use, and adequate bandwidth.

We have a 10MB duplex service through our local utility that's very reliable. I wondered about how many sessions I could expect to run through a WiFi AP. The State Library uses a Linksys WAP54G with open-source firmware that allows it to efficiently handle more sessions.

I was intrigued by this notion, but feared that the ghost of Ted Williams would intervene. And, I didn't want to take the chance on turning a perfectly good WiFi AP into a $100 brick!

[802.11n](#)

Besides, I wanted to make sure that our laptops would have Internet functionality anywhere in the library. So, that meant that my protocol would be 802.11n. Dell offered 802.11n as an Optiplex upgrade, so I bought it, then purchased a D-Link DIR-655 Xtreme-N Gigabit Router. Preliminary testing shows good range and I've had as many 8 simultaneously playing *Paradise by the Dashboard Lights* off of Youtube with reasonable performance.

 I think it's going to be fine. If not, I'll add a second one and lock half of the laptops into one and half into the other.

Connection to the AP requires the WPA-2 passkey, which is loaded onto each laptop's default connection. Thus far, I've been very gratified by the performance and reliability.
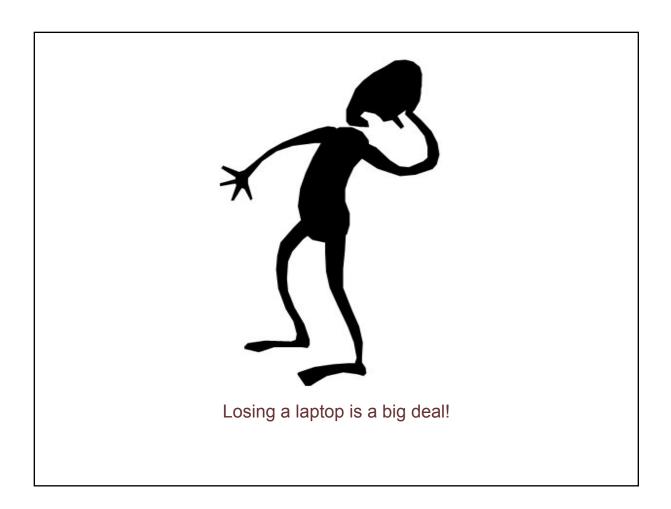
Stay tuned. It's not impossible that someday I'll install a Squid on the other side of the AP. The web caching would keep performance high without dragging down the rest of my network. And, of course, we could get fairly granular usage stats from the proxy logs.
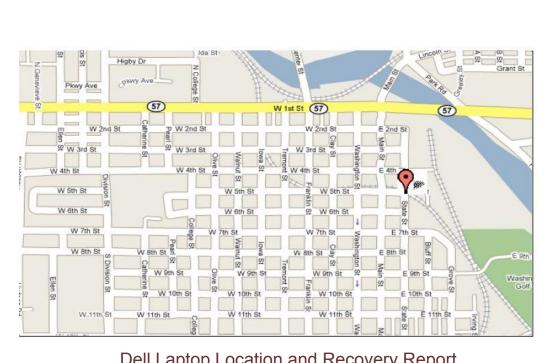
The ultimate in human interface devices!

I love touch pad pointing devices and wonder why any reasonable person would insist on using an external mouse. Our Dell laptops have excellent touchpads, but most of our users insist on a mouse. So, I've purchased 30 Labtec external optical mice for about $10.50 each. They give excellent performance,

Labtec has historically been reliable, and if they walk off I won't be working through the five stages of grief.

Losing a laptop is a big deal!

Losing a mouse I can shrug off. Losing a fully configured E5500 Optiplex with the Microsoft Office Pro Plus suite would be a big deal. So, we've taken several steps to try to hang onto our equipment and to recover it if it's lost. First of all, we purchased a 24 slot Datamation cart from Dell.

The price was a bit steep, but it has big wheels (I don't need to rip a caster off of a 500 pound cart filled with $45,000 worth of computers--thank-you!) for ease of transport, four internal power strips, a cooling fan, and very intricate doors with double locks. I don't think I could get into one without an oxy-acetylene torch (my business manager has a spare set of keys in her vault), and at a fully loaded quarter ton it would be hard to stuff in a backpack.

Dell Laptop Location and Recovery Report

On the other hand, someone could probably walk off with one during the hub bub at the end of a session. If that were to happen, we'd have two immediate issues: Would we notice the shortage? If so, how would we recover it?

Our trainers are expected to follow our protocols, one of which is to return the laptops to their cart cells immediate after class. If they find a laptop missing, they are obligated to report it.

All laptops are inventoried and bar coded. We can quickly determine which specific device is missing. Once we have figured out which laptop is gone, we can go to the Dell Laptop Location and Recovery website and determine where it is.

GPS and WiFi Triangulation

Each of the laptops is equipped with a GPS BIOS agent. Whenever the box is on the Internet, it "calls home," a web server in Canada, to report its whereabouts. Using either GPS or WiFi triangulation, the location of the device of the device can be determined with eerie precision.

A test shows that one of the laptops, located in a steel and masonry library building, in a room without windows, was located to within about 50' of my office!

The Dell Laptop Location and Recovery service will then take a theft report and will pursue the criminal. if they don't recover it, and the laptop is shown to have called in, they'll replace it. I'm guessing the actuaries are as important as the geeks in this guarantee.

Miller Time? Not quite.

So, we have the laptops on the Internet, safe, secure, with 5 years of NBD warranty for the period of the grant proposal.

The next issue is setting up the room with AV equipment that would allow users to easily teach and learn without having to fight with the equipment.

Equipment Rack

Like a many in our rapidly aging city, I'm a little on the deaf side. And, like most people with high frequency hearing loss, mere amplification is not the solution.

A clean, undistorted, even sound with little reverberation is what we need. We got that by placing six coaxial speakers in the ceiling of the former meeting, now multipurpose, room.

The speakers are fed by a rack mounted mixer sitting near the front of the room by a podium where the instructor is likely to be stand. Also feeding the mixer are a WiFi lavaliere microphone receiver, a DVD/VCR deck, and a Dell Optiplex 755 desktop computer; all rack mounted.

I hate to see trays of lemonade sitting on the top!

AV Components

- Sanyo 3,000 Lumens XGA Projector
- Ceiling Mount
- Atlas ceiling 4" speakers
- Crown 80 Mixer Amp
- Da-Lite Equipment Rack 21U
- Power Bar
- Shure Wireless Receiver
- Microflex Lavalier Mic
- Video Digital Scalar
- Mediatech ButtonMate 52 Control
- Dell Optiplex 755 Desktop

Lots of goodies in the equipment rack

Equipment Rack Control Panel: Medatech 52

The equipment rack is controlled mostly by a wedge form control panel mounted on the top of the rack enclosure. This device allows us to dispense with remote controls for the LCD projector and the DVD/VCR deck. The control panel allows the user to start and stop the LCD projector and also simplifies the choice of input: DVD, VHS, CATV, Computer, or Laptop. Using the fully programmable control panel, the operator is able to start/pause DVDs and VHS tapes and is also able to navigate their respective menus. Very cool.

I pulled a CATV cable to the equipment rack and have purchased a Visontek USB TV tuner. Some Friday evening I'll get it hooked up and will write another HOW-TO. I had given some thought to installing a separate tuner feeding into the mixer, but this sounds like a cheap and easy solution. shall see.

Meeting Room

Safety and ease of setup are two big concerns of mine. I hate trip hazards and see complicated setups as built in failure points as well as impediments to regular use. And I want to see this equipment worn out--if possible. In the spirit of safety and ease, I've decided to use a Bluetooth mouse and keyboard for the equipment rack computer.

This has caused some controversy among library staff members: I want the instructor to be untethered from the equipment rack and don't want anyone snagging a mouse or keyboard cable with a foot. They would be trip hazards, dangerous to both the teacher and the equipment. Staff members, on the other hand, are concerned about Bluetooth reliability.

I've attempted to mitigate this concern by keeping a stock of fresh AAA batteries handy and have also created a HOW-TO for turning the Bluetooth devices on and then off after use. I also have a couple of 10' USB extension cords available, just in case.

Computer Classroom!

Coiled on top of the equipment rack are two cables that support VGA and sound support for a laptop computer. Frankly, if I were in a hurry and couldn't get the rack mounted computer to do what I wanted, I'd grab one of the lab laptops, plug it in, and be off to the races. Already, trainers have brought their own laptops, plugged in, and have done well.

Notice the lack of floor clutter in this classroom, setup and ready-to-go.

Datamation 24 Cell Laptop Cart

Cost about $1800. Sturdy hand rails, lockable casters

The locks are integrated with the knob latches. Both keys are needed to open. Very tight tolerances. Would be hard to use jimmy or pry bar to open.

Massive castors

Cost about $1800. Sturdy hand rails, lockable casters. Shipping weight was 309 lbs.

Full Laptop Cart

Here's the Datamation cart open. Note perforated steel box. It's fan cooled and also has plenty of power strip outlets.

I was concerned about the amperage needs and considered installing an extra wall outlet circuit to avoid breaker problems. However, the vendor pointed out to me that each of the 24 E5500s would draw a maximum of .5 amps, for a maximum of 12 ams. Figure another .5--at most--for the cooling fan and you're pulling under 13 amps on a 20 amp circuit.
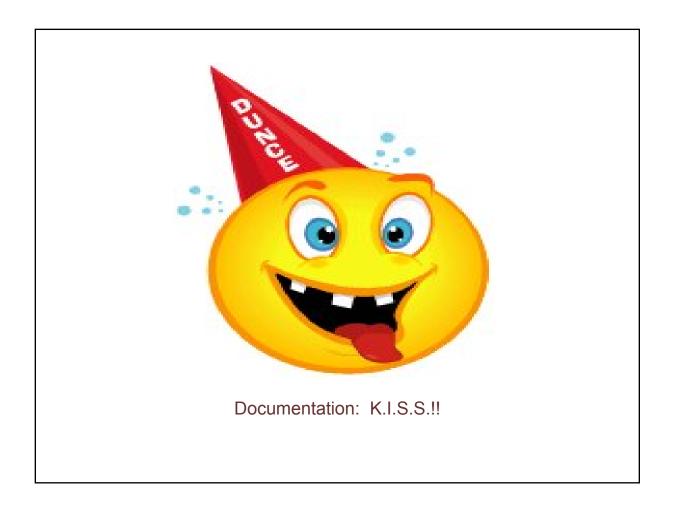
I'm also assured by Dell that it's okay to leave the laptops plugged in for extended times as they simply stop charging when full.

Nearly Empty Laptop Cart

I pull out as many as I need, leaving the power adapters in the cart. Notice the 9 cell batteries protruding from the back of the Laptops.

I'm thinking that I'll ask the instructors to not let class members help with moving the laptops. I hate to think of a bunch of Cub Scouts playing Frisbee with $1800 computers.

Documentation: K.I.S.S.!!

When it comes to documentation, Remember Ted Williams' admonition!

All kidding aside, presentations are stressful from the get-go. Add unfamiliar equipment, and otherwise sensible people can come unglued.

I try to break things down as much as possible. Bold headings for "What"; numbered lists for each step.

Use projector screen: Depress rocker switch on wall next to kitchen to raise or lower projector screen.

Use wireless microphone:
1. Equipment rocker switch "on."
2. Get wireless microphone from Reference Desk
3. Depress recessed button on end of transceiver
4. When properly operating, the transceiver LCD will read "12"
5. Clip transceiver to belt or pocket
6. Clip microphone to lapel
7. Remember to power off and return wireless microphone to Reference Desk at the end of your session

To adjust volume:
1. Equipment rocker switch "on."
2. Turn control panel volume knob clockwise for louder, counter-clockwise for quieter.

See spot run! Good boy!

At some point, we'll have a laminated set of HOW-TOs, complete with illustrative photos, chained to the equipment rack.

Documentation is probably the least fun part of any project, but essential, nonetheless. We look at the task from several perspectives. The instructors want to know what's expected of them, and what they can expect from us. Staff members also want to know who can do what and most importantly, who's responsible for all that stuff working properly and not getting damaged or lost.

The result is that we're making up policies and procedures as we go along and will probably formalize them after several months of trial and error.

Students sitting at their computers

Here you see the instructor teaching our first real class: Computer Basics.

Note that the small lights in the ceiling. Those are dimmers. We can turn off the florescent lights and modulate the dimmers.

Note all the gray heads. Elderly patrons are the biggest consumers of our computer based classes.

We've concentrated on good sound, good visibility, and few trip hazards.

Students gathered around instructor.

Here, class participants are gathered around the instructor Note that the floors are clear of wires. No trip hazards!

The Ribbon Cutting

Lots of bigwigs. Happy bank president, board president, mayor, city councilmen, director.

OCLC has recently released a study (**http://tinyurl. com/chbldx) indicating that the correlation between image and tax support is greater than that with usage.**

Projects like this get us both.

Basic Computing
Windows Basics
Basic Internet
Basic Email
Basic Social Networking
Mouse Basics
Internet Searching Basics
Intro to Word
Intro to Excel
Intro to Mailmerge
On Line Dating
Genealogy on the Internet
Intro to Picasa
Browsing the Web
Buying a Computer
Computer Maintenance

Proposed uses

Lots of things to teach. Biggest demand is for the Basic or Introductory courses. Can't do enough of them.

Instructors, on the other hand, soon get bored by basics. So, it's important to let them do something fun from time-to-time.

- Millennium Environment
- Text Based INNOPAC
- BCR Workshops
- SILO PLOW Plone Project
- Vendor database demonstrations
- Library Service Area
- Municipal Government

Proposed uses and users

This will be a great venue for staff training. The city owned utility has booked it for 21 sessions.

City Hall, Fire and Police, all have interest. My guess is that the city will eventually want a setup of their own.
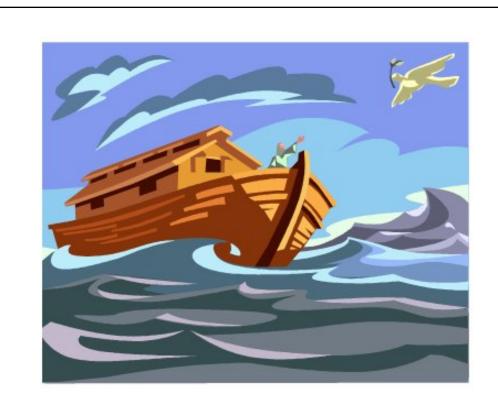
Concentration: Basic Online Literacy

I'm trying to define our education role fairly narrowly. Lots of basic classes for the masses.

Teach Picasa, not Photoshop, MS Publisher, not Quark Express, etc.

No transfer credit or certification classes.

Maybe some CEU classes for the Library Service Areas and the State Library. Must be free of charge.

Imagine Noah with Twitter!

City hall has asked if the computers could be available for emergency use. They're remembering the disasters that we had in the area last summer and think that a bunch of networked computers might be useful.

I am open to the idea and have requested that we do a drill. I've done some civil defense planning and the drills are usually a dismal failure--and, paradoxically, a success. Often times, emergency response relies on the worker bees creating ad hoc solutions as plans fall apart.

I say that we need to give one of these notebooks to a fireman and see if he or she can do anything useful with it. I'm guessing that they'll have special needs and that my security would render them useless in an emergency.

However, It wouldn't take much to create an image more suited to their needs. I could then do a cloning in about an hour or so.

We could take the show on the road.

.
Our library is handicap accessible. Wouldn't be hard to pull the cart out the door and onto a tailgate lift. The whole shebang weighs only about 500 pounds.

You could plug the WiFi AP into a network with DHCP and your encrypted network access should work.

I hope that we never do this!

The Room

Enhancements.

- Six ceiling mounted coaxial speakers
- Ceiling mounted LCD projector
- Equipment rack with enclosure
- Lavaliere microphone, transmitter, and receiver
- Combination DVD/VCR
- Rack computer with Bluetooth keyboard and mouse
- External USB TV tuner
- Mixer for the microphone, DVD/VCR, and computer
- Control panel wedge for the top of the rack enclosure
- Twenty-four cell laptop cart from Dell
- D-Link 802.11n WiFi AP and router
- UPS for WiFi AP
- Kramer video digital scaler
- Twelve 6' plastic folding tables

Some important components

The Computers

- 24 15" Dell E5500s 2gb RAM Dual Core Intel
- 15.4" LCD displays
- 9 cell batteries
- Windows Vista Business with XP Pro SP3 downgrade licenses
- 802.11n WiFi
- DVD/CD combo drives
- SD card readers
- 5 year NBD Pro Support
- Dell Laptop Location and Recovery Protection
- Touchpad
- Pointer
- External USB mouse

Business class equipment with long warranty support.

The Software

- Windows Vista Business SP1
- Office 2007 Pro Plus
- Google Chrome
- Mozilla Firefox 3
- Cute PDF Writer
- Faronics DeepFreeze Enterprise 6.3
- No Anti-Virus
- GIMP 2.6
- Picasa 3
- Putty.exe
- III Millennium Environment for Windows
- Ghost Solution Suite 2.5
- TFTPD32
- Linux boot image with Ghost Client

We'll probably be adding some Intuit titles as we go along. I want the trainers to give us proposals.

I'd like to respond to requests. It's usually possible to get academic or library prices on software.

No piracy!

The Configuration

- Restart restores computer to original state
- No Windows client. All networking is TCP/IP
- WiFi is WPA-2 encrypted
- Printing will be to IP port on WiFi AP
- Home page currently CFPL website--will be a blogspot.com blog
- All users have administrator privileges
- All automatic updates are disabled

We'll probably be adding some Intuit titles as we go along. I want the trainers to give us proposals.

The Future?

- Improve cloning technique
- Implement printing
- Implement webcams
- Movie nights
- Games (e.g., Wii, Guitar Hero, Rock Band, etc.)
- Expand use to other library departments
- Emergency use by city

This has been a long and winding path. In a nutshell, things have gone much better than I had planned. The equipment and installation was less expensive than I had planned, simpler to operate, and thus far, quite reliable. I'm looking forward to heavy use over the next few years.

This presentation created with:

- Google Docs Presentation
- Picasa 3
- GIMP 2.6
- Chrome
- Office 2007 Clip Art

Thank-you for listening

questions?

Contact me at: dargan@gmail.com

Mike Dargan