

Thin Client Upgrade Project

Process Flow Diagram

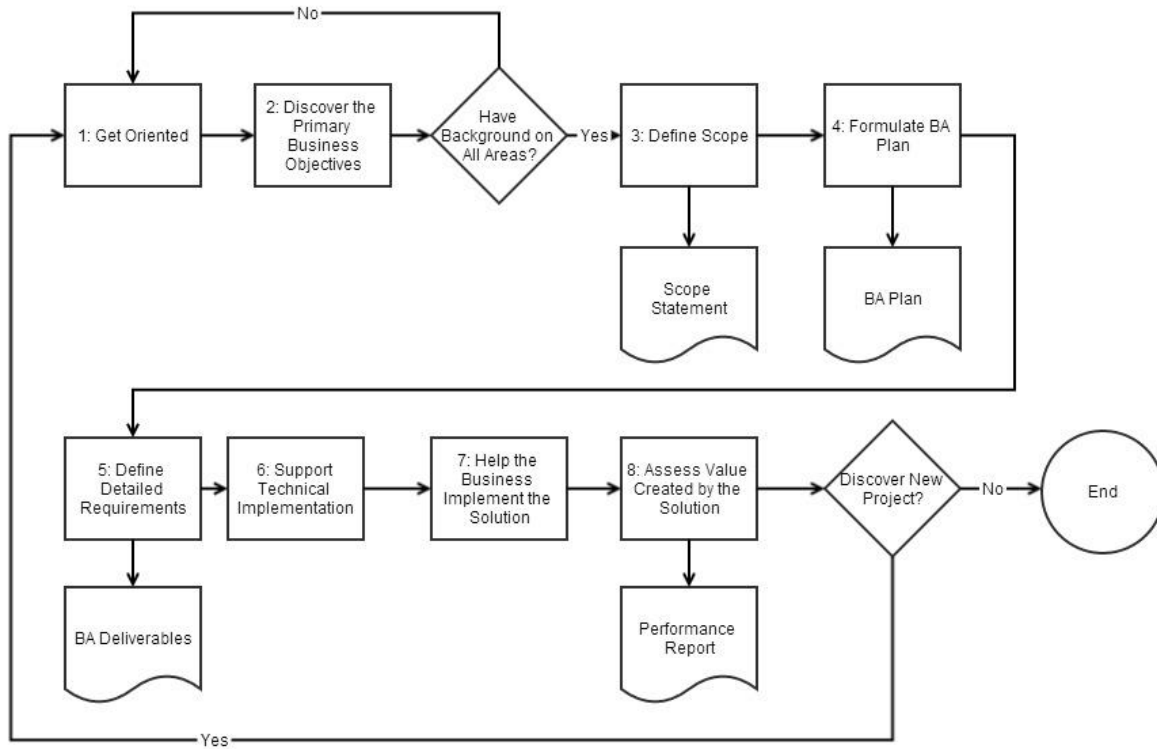


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Orientation

My role as the Business Analyst will include the following:

1. Document current thin client specs and facilities they are located at.
2. Obtain test models from various vendors.
3. Perform testing.
4. Recommend solution.

Stakeholders include:

- Chris – Business Analyst
- Richard – Project Manager
- Orlando – VDI Systems Administrator
- Steven – Client Services Manager
- Eric – Network Administrator Manager
- David – Network Administrator
- Physicians
- Medical Staff

Stakeholder	RACI
Chris	R + A + C
Richard	A + C + I
Orlando	C
Steven	C + I
Eric	C + I
David	C
Physician	I
Medical Staff	C + I

Responsible - performing the needs assessment,

Accountable - approves needs assessment

Consult – provides input

Inform – receive the result

In the past, a thorough diagnostic was not performed on the wireless chip reliability. We ended up purchasing about 1500 thin clients that performed poorly on a wireless network resulting in virtual desktops (VD) not being assessable.

Additionally, as this model became unsupported, we started replacing them with newer models housing the same chips without properly testing first.

Out of the 1500 thin clients, there are about 600 workstations on wheels (WOW). The existing thin clients are unreliable as the VDs are not staying connected. Staff is having to manually reconnect to the virtual machines (VM) when wanting to use the WOWs.

Primary Business Objectives (Needs Assessment)

Stakeholder expectations:

- Reliable WOWs that will stay connected to the virtual machine.
- The new hardware will have a 5-year life cycle.

5 Whys:

ISSUE: Our VM are not staying connected
1st Why?
The thin client we chose is unreliable
2nd Why?
The existing hardware was not thoroughly tested before purchasing
3rd Why?
Rush to made a purchase within budget timeline
4th Why?
The funding for the thin client would have been lost
5th Why?
The funds would have been diverted to other hardware purchases
RESULT: Need to vet hardware without time constraints

The goal is to test various thin clients on the network to see which one performs the best. In addition, the LAN/WAN team is stating that the thin client will need to be mounted outside the cart. Additional resources will need to be brought in for obtaining the correct hardware needed to provide this functionality.

The object of this project is to purchase 1600 new thin clients with the most reliable wireless card and have them mounted outside the WOW.

Scope of Work

Glossary

WOW – Workstation on Wheels

VD – Virtual Desktop

VM – Virtual Machines

PM – Project Manager

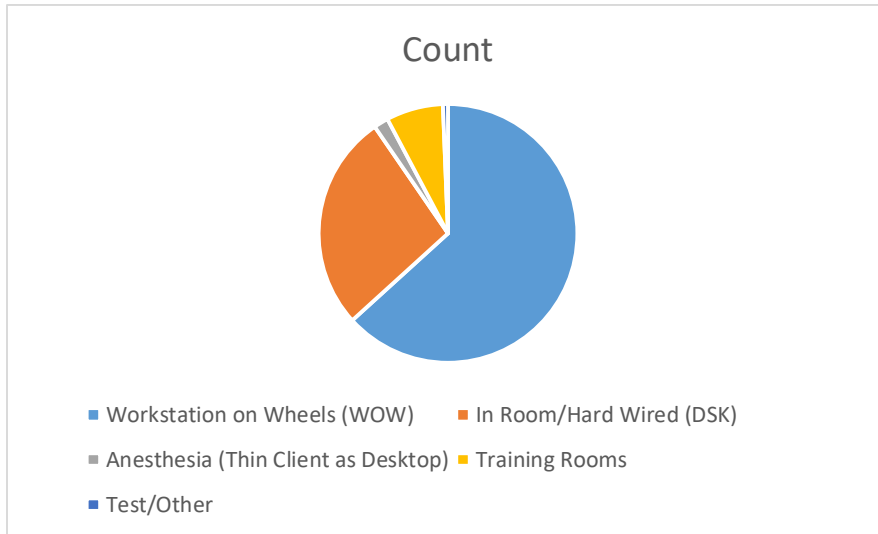
BA – Business Analyst

Problem Statement

We will be addressing the wireless reliability issues revolving around the thin clients and the issues with VMs not being available. Currently expecting to impact about 70% of all our wireless thin clients

Goals of the Agreement

The goal of this project is to purchase 1600 new thin clients with the most reliable wireless card and have them mounted outside the WOW.



Objectives of the Agreement/Deliverables

Will have purchased and implemented 1600 thin clients to address the wireless connection issues with a lifecycle of 5-years.

Administration

Chris – Business Analyst

Will define and describe the project. Will communicate results to management and the PM.

Richard – Project Manager

Will plan, test, build and implement the change. Will hold weekly meetings for all invested in the project on progress and issues.

Orlando – VDI Systems Administrator

Will assist with any VM related issues or requests. Will write the script necessary for auto launching the thin client.

Steven – Client Services Manager

Will approve all decisions made by the BA and PM. Provide advice as necessary.

Eric – Network Administrator Manager

Provide requirements for hardware mounting outside the cart and provide approval for final solution.

David – Network Administrator

Assist with testing wireless in discussed facilities.

Physicians

Provide feedback on implemented hardware

Medical Staff

Provide feedback on implemented hardware

Timeline

Document current thin client specs and facilities.	5 days
Obtain test models from various vendors.	10 days
Obtain USB Wireless adapters and antennas.	10 days
Using special WiFi software, test wireless reliability	20 days
Test multiple positional configurations (inside WOW vs. outside WOW).	3 days
Recommend a model to be purchased.	1 days
Time to implement	90 days
Purchase Brackets	15 days
Purchase power adapter tips	90 days
Purchase faceplate	30 days
Total time to implement	180 days (6 months)

Business Analysis Plan

1. Document current thin client specs and facilities.
2. Obtain test models from various vendors. These includes:
 1. HP T520 Intel
 2. HP T520 Broadcom
 3. HP 800 Mini PC
 4. HP T620
 5. Dell 3290
5. Obtain USB Wireless adapters and antennas. These include:
 1. USB Adapter
 2. Monitor Mount
 3. No Antenna/Inside Cart
 4. Rubber Duck
6. Using special WiFi software, test wireless reliability in the following departments:
 1. CCH
 2. FCH1
 3. FCH2
 4. FHH
 5. TCC4
7. Test multiple positional configurations (inside WOW vs. outside WOW).
8. Recommend a model to be purchased.
9. Facilitate implementation support as needed.

Detailed Requirements

There are going to be some fundamental changes that need to occur that we were unaware of during the requirements phase. They are listed below and have been updated in the scope of work.

1. The VM will need to stay connected for more than 8 hours straight while roaming
2. The VMs will need to automatically connect requiring a script to be written to perform the task.
3. All WOWs will need to be retrofitted with new power tips. As we cannot order these and they will need to be made, we are looking at a 3-month lead time.
4. The brackets that we need to mount the thin clients on the outside of the WOW cart will need to be created. We are looking at 3 weeks per order.
5. There are three different kinds of WOW carts so we will need to design three separate brackets
6. Most screws on the lid are missing. We will need to purchase additional to remedy the issue.
7. When the thin client is removed, there will be a hole on the front plate. We will need to purchase plates to cover the hole. This will be a 1-month lead time.
8. Extending the thin client outside the card will require additional USB extenders.
9. Provide documentation for the temp staff and Workstation Engineers on retrofitting and imaging the WOWs.

Technical Implementation Support

During the implementation, I assisted with the following:

- Attend weekly meeting to update progress or issues.
- Perform a POC on Dell Wyse thin clients and WDM.
- Test wireless performance on the following units: HP T520 Intel, HP T520 Broadcom, HP 800 Mini PC, HP T620 and Dell 3290.

Models Tested from Thin Client (WiFi Analyzer)

	Average dB *
HP T520 Intel	-36
HP T520 Broadcom	-43
HP 800 Mini PC	-49
HP T620	-54
Dell 3290	-62

Antennas Tested with Thin Client (NCS)

HP T520 Intel	Average dB *	Average snr **
USB Adapter	-31	51
Monitor Mount	-43	51
No Antenna/Inside Cart	-43	49
Rubber Duck	-44	51

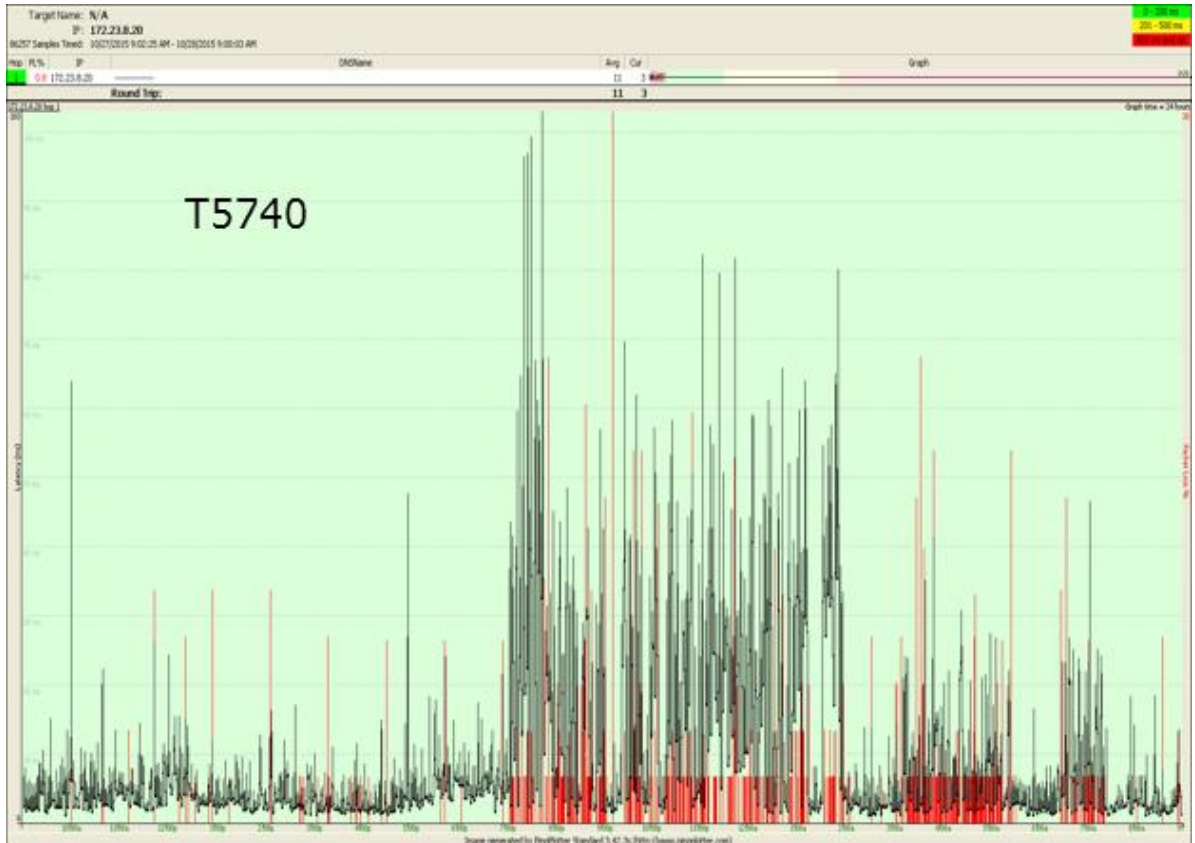
Note: Lower dB is preferable. "Poor" quality is between -100 and -80dBm, "Good" quality between -80 and -60dBm, and "Excellent" between -60 and -40dBm.

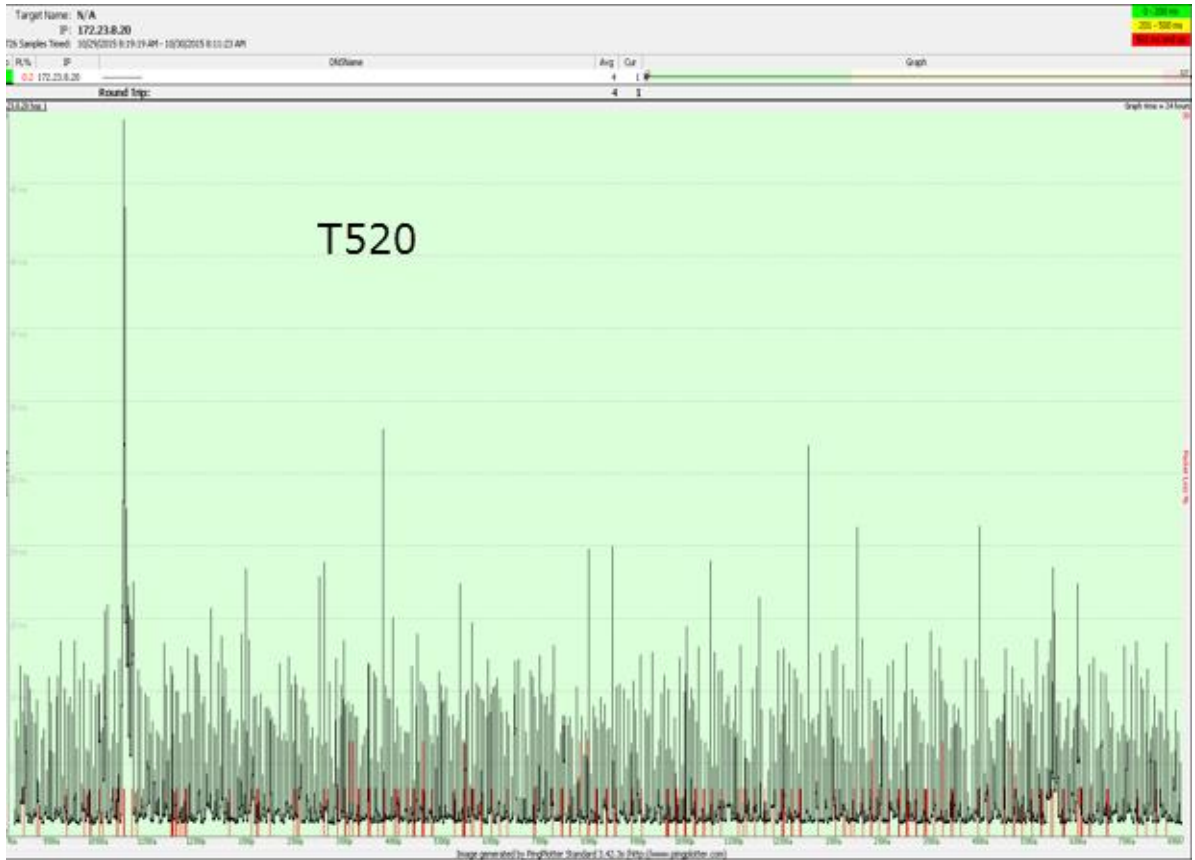
Note: Higher snr is preferable. In general, you should have a minimum of +25dBm signal-to-noise ratio

* The average was compiled from all tests performed on these devices, 37+.

** The average signal to noise ratio from all tests performed on these devices

- Test performance between T520 and T5740





- Test Intel version of the T620.
- Place order for T520 thin clients.
- Create base image for T520.
- Create TCSetup and auto launch script for the T520.
- Test T520 inside the cart and outside the cart.

INSIDE THE CART – CAS Building

Link Test from Controller 10.10.140.11 to Client MAC
d0:53:49:f2:73:47

Link Test Packets Sent 20
Link Test Packets Received 20
Local Signal Strength(dBm) -54
Local Signal to Noise Ratio(dB) 39

Link Test from Controller 10.10.140.11 to Client MAC
d0:53:49:f2:73:47

Link Test Packets Sent 20
Link Test Packets Received 19
Local Signal Strength(dBm) -55
Local Signal to Noise Ratio(dB) 38

Link Test from Controller 10.10.140.11 to Client MAC
d0:53:49:f2:73:47

Link Test Packets Sent 20
Link Test Packets Received 20
Local Signal Strength(dBm) -55
Local Signal to Noise Ratio(dB) 38

Link Test from Controller 10.10.140.11 to Client MAC
d0:53:49:f2:73:47

Link Test Packets Sent 20
Link Test Packets Received 20
Local Signal Strength(dBm) -55
Local Signal to Noise Ratio(dB) 38

OUTSIDE THE CART – CAS Building

Link Test from Controller 10.10.140.11 to Client MAC
d0:53:49:f2:73:47

Link Test Packets Sent 20
Link Test Packets Received 20
Local Signal Strength(dBm) -57
Local Signal to Noise Ratio(dB) 36

Link Test from Controller 10.10.140.11 to Client MAC
d0:53:49:f2:73:47

Link Test Packets Sent 20
Link Test Packets Received 19
Local Signal Strength(dBm) -56
Local Signal to Noise Ratio(dB) 36

Link Test from Controller 10.10.140.11 to Client MAC
d0:53:49:f2:73:47

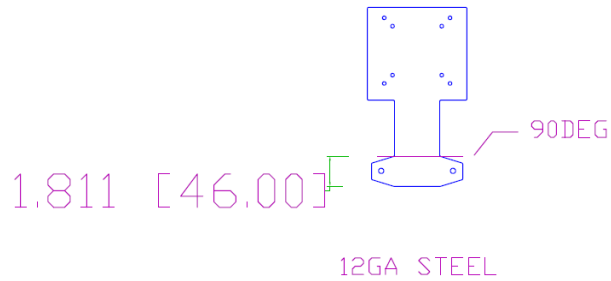
Link Test Packets Sent 20
Link Test Packets Received 20
Local Signal Strength(dBm) -56
Local Signal to Noise Ratio(dB) 37

Link Test from Controller 10.10.140.11 to Client MAC
d0:53:49:f2:73:47

Link Test Packets Sent 20
Link Test Packets Received 20
Local Signal Strength(dBm) -58
Local Signal to Noise Ratio(dB) 34

- Perform internal testing of the T520.

- Design and order brackets.



- Field test T520.
- Test adapter settings.

T520 Advanced Adapter Settings

Intel Dual Band Wireless AC 7260: Driver Version 16.1.5.2

802.11n channel width band 2.4 GHz	Auto
802.11n channel width band 5.2 GHz	Auto
Ad hoc channel 802.11 b/g	1
Ad hoc QoS mode	WMM Enabled
ARPOffload for WoWLAN	Enabled
Bluetooth® AMP	Disabled
GTK rekeying for WOWLAN	Enabled
HT mode	Disabled
Mixed mode protection	CTS-to-self Enabled
NS offloading for WOWLAN	Enabled
Preferred band	1. No Preference
Roaming aggressiveness	4. Medium-High
Sleep on WOWLAN disconnect	Disabled
Transmit power	5. Highest
Wake on magic packet	Enabled
Wake on pattern match	Enabled
Wireless mode	802.11a

- Test brackets for external mounting.
- Rebuild the OS per the directions for new images.
- Create auto launch script.
- Create TC Setup script.
- Combine TC Setup and auto launch scripts.
- Test image and TC Setup.
- Field test new image.

Implement the Solution

My key responsibilities in this step included:

- Attend weekly meeting to update progress or issues.
- Create documentation for deploying hardware mounts.
- Train staff on deploying hardware mounts.
- Create documentation for deploying thin clients.
- Train staff on deploying thin clients.
- Resolve issues as necessary.
- Assist Project Manager as necessary.

Assess Value Created by the Solution

From above: The object of this project is to purchase 1600 new thin clients with the most reliable wireless card and have them mounted outside the WOW.

All 1600 thin client have been replaced and mounted outside the cart. Do to my extensive testing of wireless cards between various models of thin clients, we have found a stable and reliable end point. Below is a list of benefits from deploying the new hardware.

It is estimated that the thin clients were reliably connected about 30% of the time. This number has increased to 95% increase in wireless reliability

Benefits of upgrading our thin clients:

- **Security was greatly enhanced** in the t520:
 - No plain text passwords are stored on the device. A limitation we had with the T5740.
 - The thin client is no longer on the domain.
 - The password for the Administrator and User accounts have been changed.
- **Improved support for wireless** was lacking in Windows XP which required us to use the manufacturer adapter utilities. Wireless support natively has been significantly improved in Windows 7 (per our testing & https://en.wikipedia.org/wiki/Wireless_Zero_Configuration).
- **HP Velocity** was introduced with the T520. HP Velocity is a software solution that improves the user experience for remote desktop and virtualized applications by addressing common network bottlenecks, such as packet loss, network latency and WiFi congestion. Not available in Windows XP.
- **Internal antennas.** Currently we estimate that 70% of all the WOW cart antennas are damaged or completely broken. The t520 uses internal antennas which would resolve this issue.
- **Auto Re-Connect.** There is now an application running in the background that will continuously try to auto reconnect to the VM if it temporarily drops.
- **Remote application and image pushing.** Hard drive space was limited on the t5740 making future upgrades impossible. This also prevents us from being able to remote image thin clients which in turn requires us to have to dispatch a tech.
- **Reduced management hours** when creating and configuring multiple images.
- **OS compliance.** 88% of our thin clients were are on a discontinued operating system.

- **Hardware compliance.** 88% of our thin clients were out of warranty.
- **Policy management.** Wireless profiles and settings can be managed via policy instead of through configuration files located on the t5740.
- **Improved hardware** of the t520 includes:
 - AMD Dual-Core processor. The t5740 has 1 – 1.66 GHz processor. Faster processors increase startup and loading time of the OS and native applications.
 - 4 GB of RAM. This has doubled from the t5740. This improves the thin clients multitasking availabilities.
 - Intel based, dual band adapter. Our testing showed that this adapter doubled in performance over the Atheros adapter and solved roaming issues.
 - Increased hard drive space from 2 GB with the t5740 to 16 GB with the t520
 - USB 3.0 support. This allows us to reimage the t520 in half the time previously. From 27 minutes to 12 minutes.

Current Issues with Existing Thin Clients	Solutions provided by the T520
On the domain. This allows them to be visible to other devices and to be affected by domain services such as policy and domain related issues.	Not on the domain. This eliminates the effects of any domain related issues from affecting it.
Plain text passwords are stored on the units. Due to the limitations of legacy software, plain text passwords needed to be stored on the thin client.	Eliminated the need to store plain text passwords. With the newest software available, we are able to securely store encrypted passwords on the device for connecting the VM.
Wireless performance on Windows XP is lacking. Wireless technology wasn't really improved until after Windows XP. This required us to have to use utilities provided by the vendor.	Wireless performance greatly improved with Windows 7. This allows us to use the native wireless controller not having to rely on vendor utilities removing a point of failure.
Use an external antenna. We estimate that 65% to 70% of all antennas on a WOW are currently broken.	Internal antennas. The T520 uses internal antennas. This eliminates the chance that a user can break an external mounted unit
Only have 1 antenna to share 2.4 and 5.0 frequencies.	Dual band antennas. Both antennas utilize the 5.0 frequency. Only one of them uses the 2.4 when necessary.
Uses old USB 2.0 standard. This makes imaging the thin clients extremely slow.	USB 3.0 Support. The newest USB standard allows techs to reimage thin clients at half the time needed with 2.0
Will not auto connect the VM. During a failure event, the thin client will not automatically relaunch the VM leaving it in a degraded state.	Auto launching capabilities. I have created a program that will keep trying to connect the VM if it ever fails or disconnects. So when wifi is restored or the VM is recovered, it will automatically launch
Limited resources. Limited disk space makes updating or imaging these units remotely	Increased resources. With 9 times more hard drive space, we are able to remote image the thin clients and allow software support. This

impossible. PColP caching is also not possible. Processor speeds and memory are lacking.	also allows for PColP caching. Dual core processor with a Radeon graphics card improves visual support.
No network caching options. This means that packet loss, latency, and jitter are not optimized.	HP Velocity. This new feature by HP are used to help battle packet loss, latency, and jitter by caching network traffic ahead of time.