Unified Communications for the University of Cincinnati

By

Nick Newswanger

Submitted to
the Faculty of the Information Technology Program
in Partial Fulfillment of the Requirements for
the Degree of Bachelor of Science
in Information Technology

University of Cincinnati
College of Applied Science

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_____   _____

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Communications and submit a final vendor recommendation based on my research.

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Abstract

Unified Communications for the University of Cincinnati is a research project that will be used to help choose a new voicemail system and implement newer Unified Communication products. Management within the University would like to increase overall productivity while minimizing the financial hit. Within this document, four companies will be analyzed regarding their Unified Communications and voicemail products. The companies are Microsoft, Cisco, Avaya, and AVST. Each of the companies offers roughly the same products but each has its compatibility issues. With Unified Communications, if one part to the solution does not work properly than the entire project could be in distress. All products currently installed within the University must work seamlessly with the new software or the concept of Unified Communications has failed. This research will help guide the University down the proper Unified Communications path to fulfill their needs. The research will also help determine costs incurred with each of the solutions as well. The overall gain for this project is the increased productivity and mobility. This project will help the University decide a proper course of action regarding an effective and efficient Unified Communications solution, while being cost efficient.

Unified Communications for the University of Cincinnati

Problem

The University of Cincinnati is a public University located in south-western Ohio. The University currently provides simple Unified Communications (UC) solution. UC has grown very quickly over the past ten years to include more advantageous products, which have not been deployed at the University. The University would like to see a much more effective UC solution on its network, which does not require a forklift upgrade and adheres to the current tech stack.

There is no one solution to the UC question, for any company. Many vendors have tried to offer a one-size-fits-all scenario, but do not always fill every need. The current voice-mail system for the University is supplied by 3com. The 3com system has become an issue for the University for multiple reasons. Two major reasons are complexity (due to custom alterations) and loss of technical support from the vendor. The product has been customized by UC and 3com to solve unique issues to the point that 3com refuses to support the system. While creating the custom features, which led to the loss of vendor support, the University lost their functioning unified messaging (UM) capabilities. UM creates a link between voice-mail services and E-mail services. UM allows a user to receive voice-mails in their E-mail inbox as well as their normal voice-mail (16).

Another UC tool currently offered is the collaboration/eLearning tool, Elluminate, which is used for e-classrooms, but is also available for employees. Elluminate satisfies the educational and the business side of the collaboration spectrum. The University is different from the average business because it has two major customer bases, the employees and the students. Elluminate is

most commonly used with <u>Blackboard</u> services to supply students with online learning communities, classes, and collaboration. Elluminate can be enhanced by adding a much more powerful server, by advertising it more, and using it during meetings (14).

Elluminate can help increase productivity by allowing employees who are not in the same building to reduce travel time by simply meeting in a room located in their own building, connected via Elluminate. Elluminate does not require registered users, according to Don Rainwater, a UCIT employee and head of the Elluminate project. No other company allows for non-registered users. Requiring registered users can cause issues for adjunct employees and visiting scholars who may not have the proper status or information to connect (14). Elluminate does not immediately work with the Office Communicator Suite. There are software development kits (SDK's) available to work out a solution. Elluminate is also capable of running on both PC and MAC, increasing functionality.

Elluminate can solve the collaboration, web conferencing, video conferencing, and some social networking aspects of the business and educational world. According to the Elluminate Web site, the products are optimized for learning, and they are a very strong competitor in the UC world. One inherent problem with Microsoft's products is that they do not play well with MAC-based products. This alone will isolate DAAP and CCM, which are MAC heavy users, thus causing major issues with the UC solution. Elluminate will help bridge that gap and MAC messenger will allow for IM services on the Office Communicator tech stack. Some of the features native to Office Communicator may have trouble running on MAC products. Having Elluminate available allows both PC and MAC users to continue the UC concept and effectively

solve the compatibility error (6).

This project is targeted at deploying a UC solution using Microsoft's Office Communicator 2007 R2, Applied Voice and Speech Technologies (AVST) Voice-mail system, and Elluminate e-classroom/collaboration tools. The solution detailed within this document is subject to change in response to future vendor meetings and budget adjustments. The final report to the University will contain multiple suggested solutions to the UC dilemma. Other products to be reviewed will be Cisco's unity voice-mail services and unified communications manager, and AVAYA's voice-mail and Unified Communications solutions. This list is subject to change as major competitors are discovered or provide viable products.

Current Configuration

University of Cincinnati Phone/VM/UM system
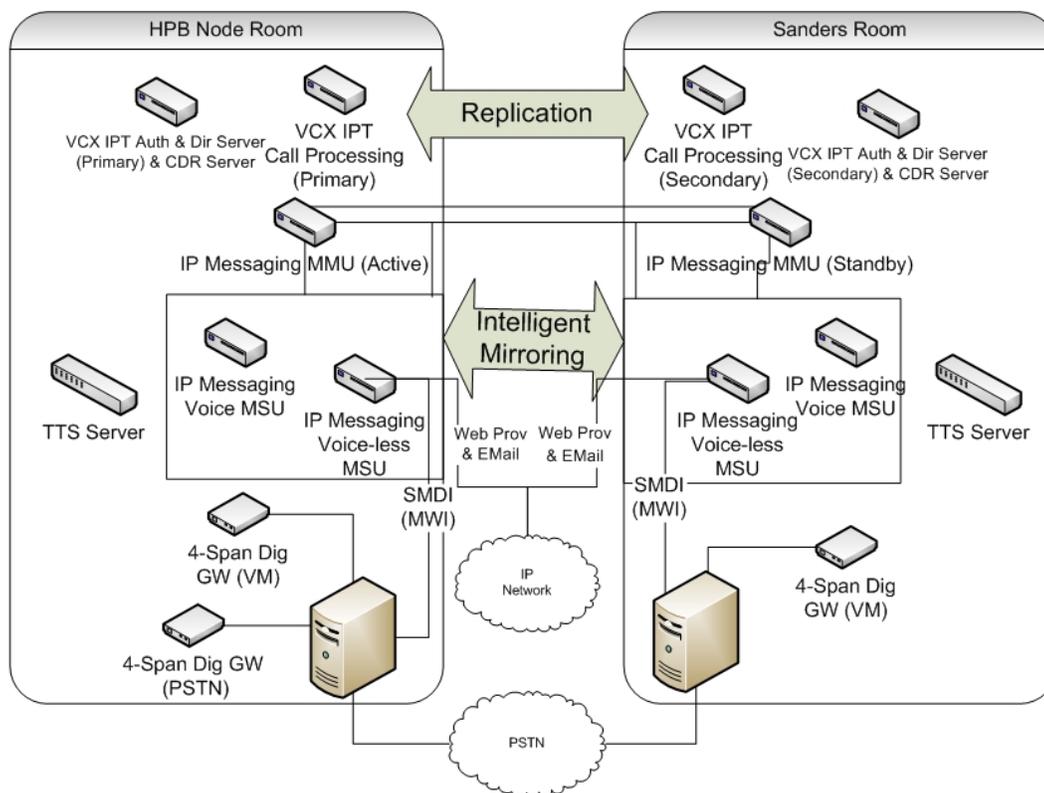
Figure 1 *University of Cincinnati Phone, Voice mail, Unified Messaging architecture* (16)

The diagram above depicts the current phone system and Unified Messaging (UM). The

functioning PBX is an Aastra Pointspan PBX with a 3com voice-mail and call processing center.

The 3com system is user friendly with a UI that displays accurately what is happening within the

call processing unit and voice-mail service. However, the 3com software is no longer supported

by 3com, as stated above, due to the unique customizations that the University has been required

to do, thus forcing the University to search for a new product. The 3com system also supplies a

UM system providing basic voice mail to E-mail services. This service currently does not work

properly due to various customized configurations made by 3com and the University. There are no fully unified, communications services deployed within the University. A large majority of the hardware shown above will be replaced with AVST's call processing and unified messaging products. The only product that will not change is the AASTRA PBX (16).

If the University were to replace the Aastra PBX, they would be required to engage in a forklift upgrade. A forklift upgrade basically means the University would need to replace the current PBX with a newer IP based PBX, while simultaneously replacing around 12,000 phones. With the current state of the economy attempting a forklift upgrade would be financially irresponsible. Instead, the University must choose a phone system and VM system that supports IP-based phone services for a scalable and slower approach to adapting newer technologies.

The Elluminate deployment is not shown above. The Elluminate software is currently installed on a single <u>Blackboard</u> server. This will need to be upgraded, depending on the number of intended users. Business units within the University rarely use the software at this time. The software is available to all employees at the University and all students in order to enhance learning and collaboration. To have a fully unified collaboration tool the product must work for both MAC and PC. The Office Communicator tools do not work perfectly with Mac, so Elluminate will be used to bridge the gap as stated in a previous paragraph.

Product Description and Intended Use

The University is missing many of the key components to solve the UC problem, such as:

- A fully functioning UM service

- Standard IM (Instant Messaging) platform

- Unified Collaboration Tools

  ◦ Web Conferencing

  ◦ Audio/Video Conferencing

- Presence technologies

- Telepresence technologies

- Mobile capabilities

The University lacks many of the newer and better UC solutions. One possible solution that may be provided to the University utilizes the Office Communicator 2007 software, supplied by Microsoft, and CallXpress 8 call processing and voice-mail services supplied by AVST. AVST's CallXpress software and hardware cannot be tested on the live communications system, which was a key point brought up by Tom Ridgeway, during the AVST vendor meeting (13). The Office Communicator 2007 software can be tested because Microsoft offers a trial period for their software. The Microsoft software will not directly affect the communications currently running because there are no tools in use that resemble the Office Communicator software.

AVST CallXpress 8

CallXpress may be recommended to replace the 3com products at the University. CallXpress will be a better solution than the current 3com products because AVST claims greater flexibility with multi-vendor networks. AVST has a very strong case because the University maintains a

large network containing multiple vendors which are required to work seamlessly. Breaking the seamless integration will lead to a failed UC deployment. AVST is also a partner with Aastra, the University's PBX supplier. Having the relationship between the call processing/voice-mail company and PBX supplier adds more reassurance to a successful deployment (13).

CallXpress offers many of the same features as the 3com system but adds more flexibility and technical support. Many of the features offered by AVST are included with the standard installation reducing confusion with product licensing. The AVST hardware will replace the current 3com call processing and routing systems as well as the voice-mail system. The AVST system will introduce many new or expand upon existing features (13).

CallXpress will also offer a UM solution to the University. Voice-mail will be sent to both the voice-mail indicator on the phone as well as an audio file directed to the user's voice-mail inbox. The user is able to forward the voice-mail audio file like any other E-mail, or store it in a separate folder to be listened to again at a later date. This service will work for both Windows (exchange) and Mac (IMAP) E-mail clients. The technology for this service utilizes G.711 and GSM VOIP codecs. G.711 is a commonly used audio codec for VOIP functionality (4). GSM is another audio codec which is less resource intensive but is not commonly used for VOIP due to licensing costs (18).

Another feature available, to the user, is the ability to alter their outlook calendar or check E-mail via voice-mail personal assistant. The personal assistant feature will provide the user with multiple options such as; updating presence information, checking E-mail, checking voice-mail,

and adding an auto response greeting when you are unable to answer the phone. The auto response option will give instructions to the caller to either leave a voice-mail or let them know that the user is too busy to take a call and will return the call as soon as possible. The auto attendant feature will remind the user to call that person back.

The user also has the ability to alter their outlook calendar with the personal assistant feature. They can either block out certain parts of their schedule or add/cancel meetings. The features above are just a few features regarding the personal assistant, which adds a mobility function to the overall UC solution. Employees can use standard cell phones, non-smart phones/blackberries, to utilize the personal assistant feature (13).

Licensing for the AVST product is based on ports used on the PBX. Currently the University maintains 120 ports on the Aastra Pointspan PBX for internal and external calls. To use the AVST software the University will need to purchase 120 licenses. The amount of users does not have any effect on the number of licenses, unless the number of phone calls exceeds the internal and external ports on the PBX. If the call volume exceeds the current number of ports then additional ports must be added. The standard license will give all the users basic features of the AVST CallXpress service such as the following; Unified Messaging, 50 Personal Assistant licenses (more can be purchased as needed), Voice mail, and the ability to have multiple phone numbers connected to a single voice mail account (13).

The UM services work for both IMAP and Exchange clients. Coming with the next release will be support for secure IMAP, which is required by the University. The support of both IMAP and

Exchange allows the unified messaging services to work with both MAC and PC E-mail clients. Having multi-protocol capabilities allows for a more unified approach. Introducing a single system solution, such as PC only, will only cause problems. Two major colleges, DAAP and CCM, are heavily MAC based and would jeopardize the idea of UC if a PC only solution were implemented. There are also many individual users within the University that prefer MAC products to PC.

Office Communicator 2007

Office Communicator 2007, or OC2K7, will be the second piece of the UC puzzle. Office Communicator will help solve most of the remaining UC issues. OC2K7 will provide for a majority of what CallXpress does not. OC2K7 will provide instant messaging (IM), collaboration tools, audio/video conferencing, presence capabilities, and Telepresence services. Most of the services listed above will only work on PC based products. MAC users can use MAC Messenger, but may have trouble using the advanced services supplied by OC2K7.

The University currently lacks a unified IM service. Many of the employees use Windows Live Messenger, AOL's Instant Messenger, and Google Messenger. The variety of messaging programs causes communication issues for employees because they may be required create three different IM accounts to communicate with other employees effectively. OC2K7 offers the Office Communicator Messenger which is an IM service. The IM service offers presence technologies, video/audio conferencing shortcuts, as well as phone service shortcuts (12).

Presence technologies allow a user to choose their availability with a few simple clicks. The

user is able to decide if they are unavailable at a certain time or post a 'do not disturb' sign. The

presence tool can link up with a user's calendar to help determine availability. If a user is

currently in a meeting, the user's status will display that they are currently in a meeting.

Administrators can also determine which users are allowed to communicate with certain

employees. This can help enforce the tier system for helpdesk or other support positions by

creating a buffer between tier 1 and above support professionals. The presence service can also

be linked up to each user's phone as well. If the user is currently on a call then it will display

that on the messenger program (10).

The purpose of presence technologies is to increase productivity by decreasing wasted time

trying to find coworkers. When an employee knows another employee availability it can help

cut down on lost time attempting to track down that employee. Presence technologies give

employees the ability to let other co-workers know the best way to contact them at any specific

time. For example; when an employee is working from out of the office they can create a status

update that lets employees know they are telecommuting for the day. Updating presence can

inform anyone trying to find that person the best way to contact is either phone/E-mail/IM.

Employees can either choose from preset status updates or customize their own (7).

The do-not-disturb function can be customized to stop all instant messages from interrupting

their work, but still allow select people to IM them. With AVST's CallXpress, calls could also

be blocked by the personal assistant feature. The personal assistant feature will inform the user

that a specific person called but not disturb them with a ringing phone. If a call is not returned

within an administratively, or user, set time, the personal assistant will inform the employee to call the previously blocked person (13).

Another feature of OC2K7 suite is audio/video conferencing. A user can simply right click another user, within the IM program, and initiate an audio/video conference. Audio/video conferencing through Office Communicator Messenger can allow a user with a webcam and mike to see and talk to the other party. The purpose of this software is to increase collaboration. The ability to see and hear exactly what the user is trying to explain can be much more efficient than just talking over a phone. If no mike is available the user can just use a web-cam while talking on the phone. The University employees are spread throughout the entire campus. If an employee needs to work with another employee that is located in a different building they would either have to call or travel to the building. With audio/video conferencing the users can start up a video conference within seconds, eliminating wasted time traveling between buildings (9).

The video and audio conferencing ability also includes screen sharing capabilities. Screen sharing is native to Windows XP and up with net meeting. OC2K7 offers a better version of net meeting that allows a user to share their screen, after they have set up the video/audio conference, allowing employees to share what is on their screen. The screen share allows the user to see what changes another user is making, or take control and make the changes themselves, in real time. 'In real time' is the ability to view something going on in a different location as it is happening. The application of this technology allows employees to work together, without having to schedule a meeting room or travel between desks or offices (9).

The audio/video collaboration tool can be used by professionals to increase productivity and efficiency within an organization. The University has multiple locations within the United States, primarily in Cincinnati. There are also various sister colleges located throughout the world. At the Cincinnati location there are multiple buildings and campuses. The different locations pose a problem for the employee working with others outside of their immediate location. The ability to instantly start a Video and Audio conference with another employee in a separate location breaks down the inherent communications and collaboration barrier. The employee is instantly able to see what another employee is trying to express while in the comfort of their own office or even their homes, for telecommuters. Audio/Video conferencing offers a convenient solution to collaboration and communication issues for the University.

The mobility service available to OC2K7 users is only available for specific smart phones. Phones capable of using the software are; Windows 6.x devices, Nokia s40 series, and Nokia s60 series. There are plans to add additional products in the future. Application development (API) for OC2K7 is available to the company purchasing the product. If the University wishes, they can develop API's that include more smart phones or other similar devices. This can be a limiting factor as mobility becomes larger in the business world. The service will be convenient for those select users but an inconvenience to all others (9).

The mobility option also allows for better presence management. When a user activates the OC2K7 software on their device an update is sent to the IM service showing a mobile symbol letting people know the best form of contact is their cell phone. This feature can also be auto-configured to use the follow me functions where phone calls to a desk phone will automatically

ring the same person's cell phone as well. The mobile application also comes with outlook integration allowing users to click and join a meeting, rather than type in all of the required passwords (9).

The third, and final, piece to the UC puzzle is the expansion of Elluminate at the University. Currently Elluminate runs on a blackboard server and is mostly used for e-learning such as online classes and student collaboration tools. This service has been made available to everyone at the University, including employees. This service is compatible with both MAC and PC helping solve the compatibility issues with OC2K7 and MAC. The OC2K7 software only supports IM services on MAC based machines. Other basic services like audio/video conferencing work as well but more advanced collaboration will not work perfectly. Elluminate will help bridge the gap between PC's and MAC's on the University's network. This service will need to be integrated into the OC2K7 software using SDK's and API kits supplied by Microsoft and Elluminate (6).

Elluminate will support the collaboration aspect of UC at the University. Licensing has already been purchased for the software. Before the software can be fully integrated the infrastructure will need to be upgraded to support heavier use throughout the University. Elluminate has been at the University for over a year, the service is mostly used for e-classrooms and other online learning. To increase use management must promote the use of Elluminate by using it during group meetings or for telecommuters to increase productivity. Elluminate allows for meetings of up to 200 users. These meetings can be instantly created and are open access. There are no restrictions to what types of users can join (6). There is other more advanced versions of

Elluminate offered but "Elluminate Live!" is what the University currently has installed and will be efficient for the University's needs.

Deliverables

Listed below are the deliverables critical to the success of this project. To determine the proper deliverables, all project goals were listed out and then evaluated to determine which were. The deliverables for this project are the following:

- Build a prototype with Office Communicator 2007 Standard

- Build Office Communicator 2007 Enterprise for Tech Expo

- Develop vendor analysis score card

- Submit multiple UC solutions to UCIT

- Written analysis of potential vendors

The deliverables listed above are the primary objectives of this senior design project for the University. To complete senior design, a prototype will be built and displayed using Microsoft's Office Communicator 2007 standard suite. This prototype will allow me to further understand the OC2K7 software and lead to an installation of OC2K7 enterprise edition. The enterprise edition will resemble an actual installation that the University would deploy.

The vendor analysis score card will allow for more accurate vendor recommendations by pinpointing the needs and requirements that each vendor fulfills. In the end, multiple solutions will be presented to the UC group to help determine the best course of action, regarding vendor choice. Research will be done one each vendor to help determine score card scores and the final recommendations

Risk Management

With a project of this size, risk management is a very important issue. The risks listed below, in figure two, must be dealt with according to the risk level. In the left column are the different risks that have been deemed important or possibly project ending. The center column assigns a level of risk ranging from high to low risk. Finally, in the third and right column is the recommended risk management solution. The different types of risk management are the following: risk avoidance, risk retention, risk transference, and risk reduction.

Product Quality – the chance the integrated product solution does not work on the UCIT tech stack the way it should	High Risk	Risk Avoidance – test the product and receive reassurance from the company the supplied product will work on the system
Economic Risk – The chance that overall budget could decrease due to governmental or other budget adjustments	Medium Risk	Risk Retention – If the budget does dramatically change then the project will have to adapt to the budget alteration
Testing Risk – Chance that testing within the UC lab or the vendor lab does not show an inherent problem with the system	Medium Risk	Risk Transference – if these issues do arise the vendor will be contacted to help solve the problem. The issue will also be dealt with internally.
User Acceptance – The chance the average user will not use the new technology to enhance their business productivity. Also includes misuse of the product	Low Risk	Risk Avoidance – standards will be place to help ensure a smooth migration to the new technologies for the employees.
Scope Creep – The chance the project will grow larger than originally intended by the UC board.	Medium Risk	Risk Mitigation – If new changes are requested negotiations will occur to help lower the initial scope creep to a reasonable amount or completely eliminate it if there is no need.
Integration Risk – the chance that the final product will have holes. The final product will not work seamlessly causing major issues. A true UC system works seamlessly.	Medium Risk	Risk Avoidance – standards will be set for software that must work together. If any piece of the UC puzzle does not fit perfectly then UC has not been obtained

Figure #2 *Risk Analysis*

The most important risks are economic, scope, and quality. Economic risk involves the many budget constraints occurring throughout the University and any future budget constraints that may occur. The economic risk could also include a raise in the budget, but this chance is fairly small due to the current economic state. Risk retention will help plan for a budget cut or freeze to alter the current design to fit the new budget requirements. This could include removing any parts of the UC puzzle that may not be considered critical for the current business environment.

Product Quality is rated as a high risk item. High risk means the project could come to a halt if it is not dealt with, according to the recommended risk management. Risk avoidance has been chosen to eliminate any problems with product quality. Risk avoidance was chosen for product quality because the most effective way to ensure product quality is to ensure the product will work seamlessly with the University's tech stack. High risk was applied because if the product(s) chosen do not work seamlessly the concept of UC is not satisfied.

Scope creep is an inherent problem with almost every project in the business world. Scope creep, will follow the same mitigation plan as economic risk. If the proposed addition to the project is necessary, then it can be absorbed into the project. If the attempted addition is unnecessary then it can be eliminated. If an addition has future potential it can be added into the future deployments during the project lifetime.

Timeline

	Quarter 1										Quarter 2										Quarter 3									
Week	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
Problem Need	■	■	■	■	■	■	■	■																						
Contact Companies				■	■	■	■	■	■	■	■	■	■	■	■	■														
Research		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■							
Proposal								■																						
Design									■	■	■	■																		
Build											■	■	■	■	■															
Prototype																		■	■	■	■	■								
Testing																					■	■	■	■						
Finished Product																								■						
Tech Expo																												■		
Recommendations																					■	■	■	■	■	■	■	■		

Figure 3 *Project Timeline, Revised*

The project timeline has been revised since the first quarter. Contact companies and the research sections have been increased to accommodate for the true project needs. Throughout the decision and research process more companies may be brought to the table with their products. This project is a research based project which will lead to multiple recommendations written to the University to solve its UC problem. Research has been extended to the end of the project phase, a few weeks before tech expo. During the last part of the research phase I will begin writing recommendations of UC products for the University. The recommendation process will last past tech expo and will include a score card. The score card will be used to evaluate each vendor for the final UC recommendations. The Recommendation section was added to show how the final stage of the project will be completed in a timely manner.

Budget

Product	Cost to me	Cost to UC
Office Communicator 2007	$0	$3999
Office Communicator Client	$0	$5
VMware	$0	$1000 per 2 cores
Desktop	$1000	$0
Total Cost	$1000	$5004+

Figure 4 Budget Analysis

The University will need to purchase the necessary Office Communicator 2007 R2 server

licenses. They will need to purchase enough clients to supply each computer within the

University that is running windows. This number is estimated at 8,000 user licenses which

would equate to roughly $40,000. The Office Communicator 2007 R2 server license is $3,999

prior to the educational discount which has yet to be determined. The amount of licenses

required is also yet to be determined; if the Office Communicator software is further pursued

past the initial evaluations then server requirements will be determined at that time. The total

cost only accounts for the single OC2K7 installation. Further analysis will be done on cost as

more product information is gathered. The University is an educational system so product

pricing is significantly lower than a normal business.

UC Installation and Configuration

To install Office Communicator 2007 R2 the administrator needs a small infrastructure set up. The OC2K7 R2 software must be installed on a Windows Server 2003 64bit machine. OC2K7 is not compatible with Windows Server 2008. AD is required for the installation as well and administrative rights must be set for the user to alter the AD schema. To begin the installation the administrator must have a Domain Controller (DC) configured with DNS, AD, and CA. Other services that must be configured on multiple servers are; File server, SQL server, and an exchange server. Exchange is not required; the administrator can configure the server without an exchange box deployed. If there is multiple front end servers in the deployment a load balancer must be configured as well (17).

Most of the configuration to AD and the OC2K7 server can be configured on the future Frontend server. The Frontend server is the server all users will connect through to access the applications servers hosting the different services. The Frontend server is used by internal users, external users, non-University employees, can connect through the Edge server which has an internet connection.
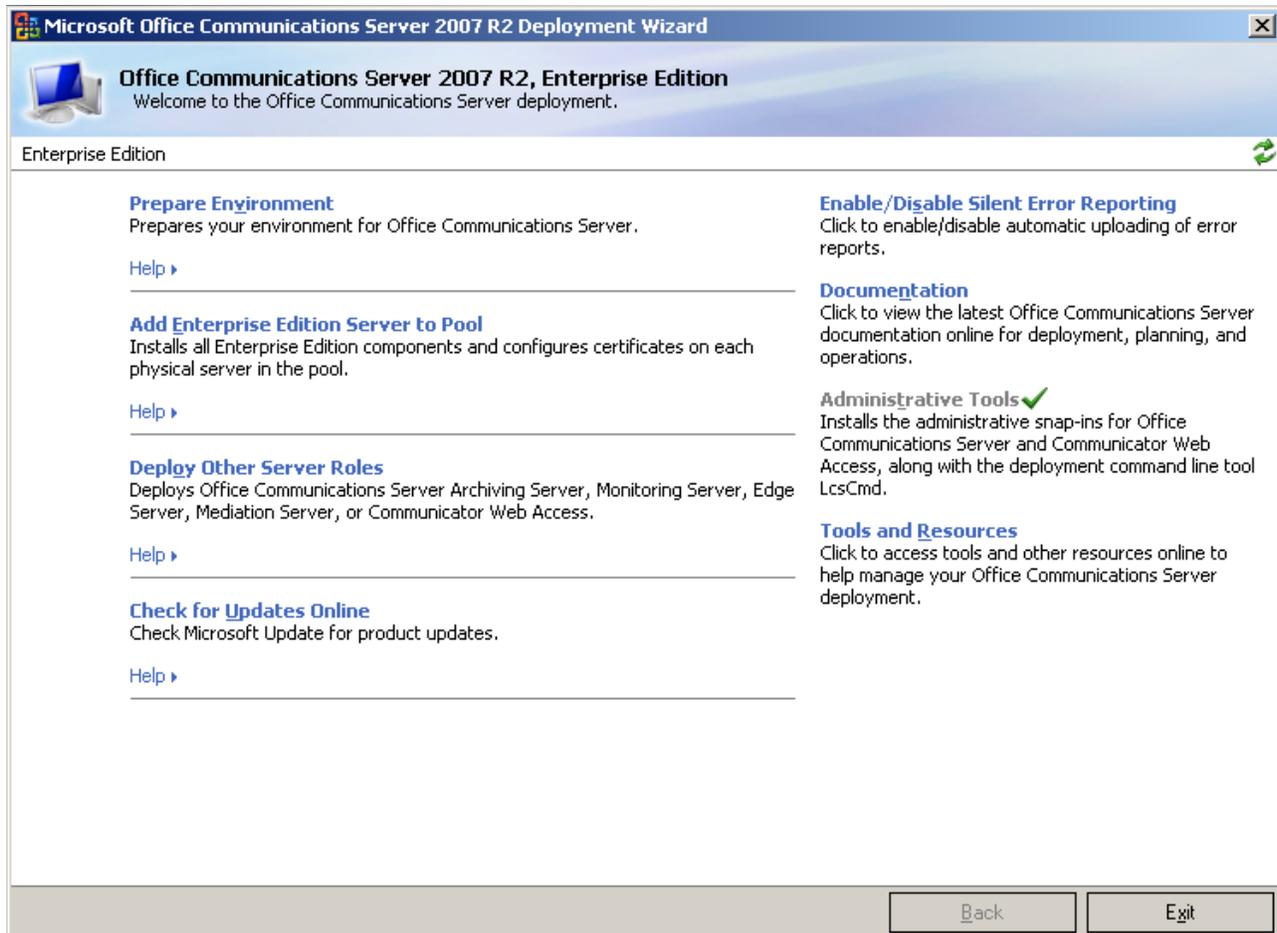
Figure 5 *Office Communicator 2007 R2 installation screen*

The above screenshot is the initial installation screen. The first two steps, prepare environment and add enterprise-edition server to pool, must both be completed before any clients can be configured to use the software. There are also tools and documentation available on the right hand side of the installation window to assist with the product installation and answer some troubleshooting questions. The first step is to click the prepare environment link. The OC2K7 software is not a straight forward installation. There are some assumed and individual steps the administrator must complete.
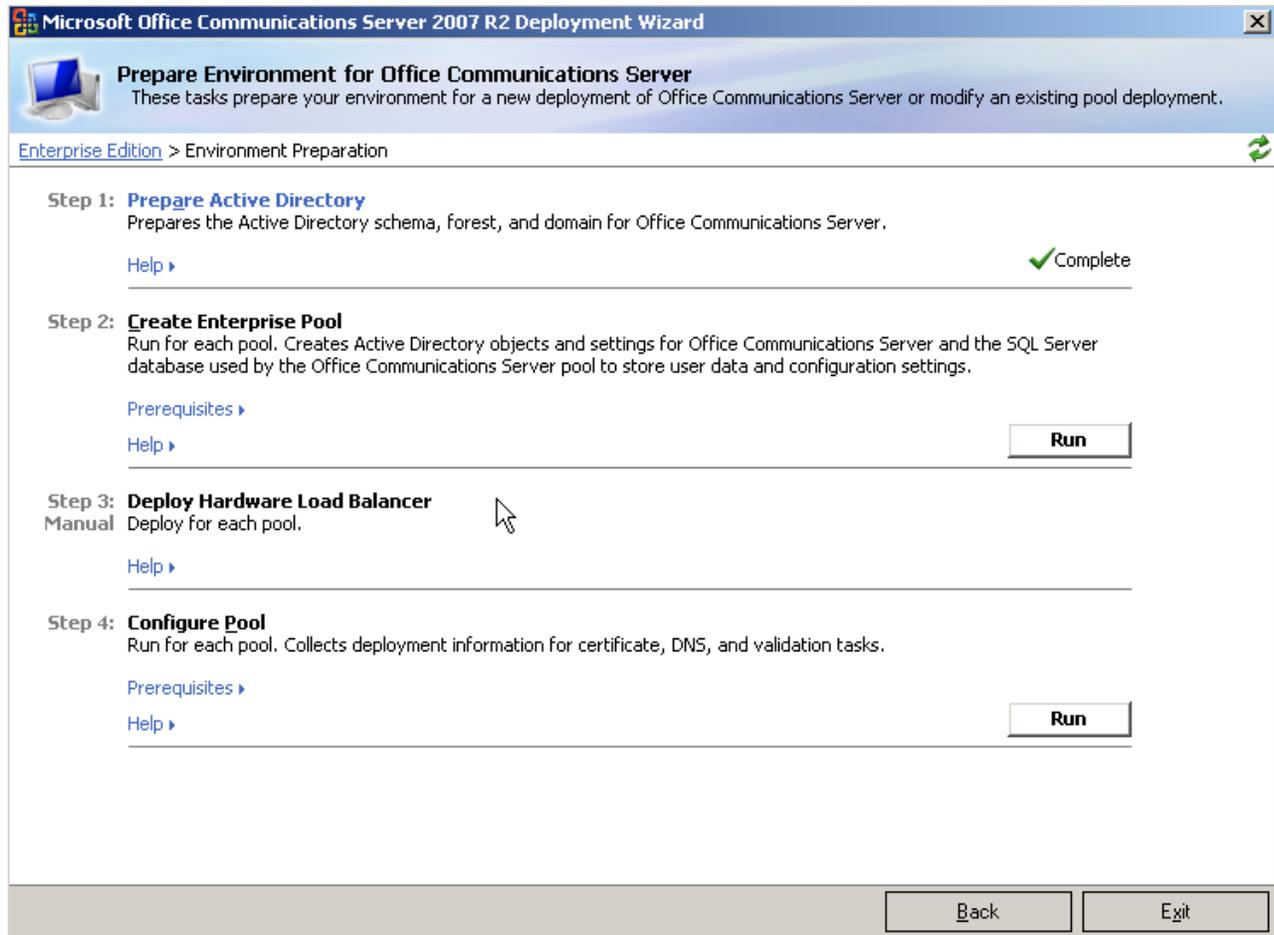
Figure 6 *Office Communicator pre-installation configuration guide*

The above figure displays the pre-installation configurations required by OC2K7. For the

standard edition deployment all of these steps are configured on the OC2K7 server. For the

enterprise deployment, if SQL 2008 is used, AD configuration can be done on the future

Frontend server but the enterprise pool must be created on the SQL 2008 server. The server is

installed as a backend server for the front end machine and all other OC2K7 machines to

communicate with. The AD configuration alters the schema and adds administrator accounts all

starting with the prefix RTC. During the configuration the administrator must choose a SIP

domain. For the prototype deployment, the AD domain was selected.

The hardware load balancer is only required if multiple front end servers and edge servers are installed. This is a requirement for all enterprise deployments because it will require more than one front end server. Any service can be used for the load balance like Big IP and ISA. The final step is to configure the pool. During this step CA is configured manually to allow machines to speak to the front send server as well as the clients. DNS records are also created using SRV records to allow automatic registration with OC2K7 users. Once the pool is configured and the final steps of pre-installation have been completed, the Office Communicator can be installed on its own server.
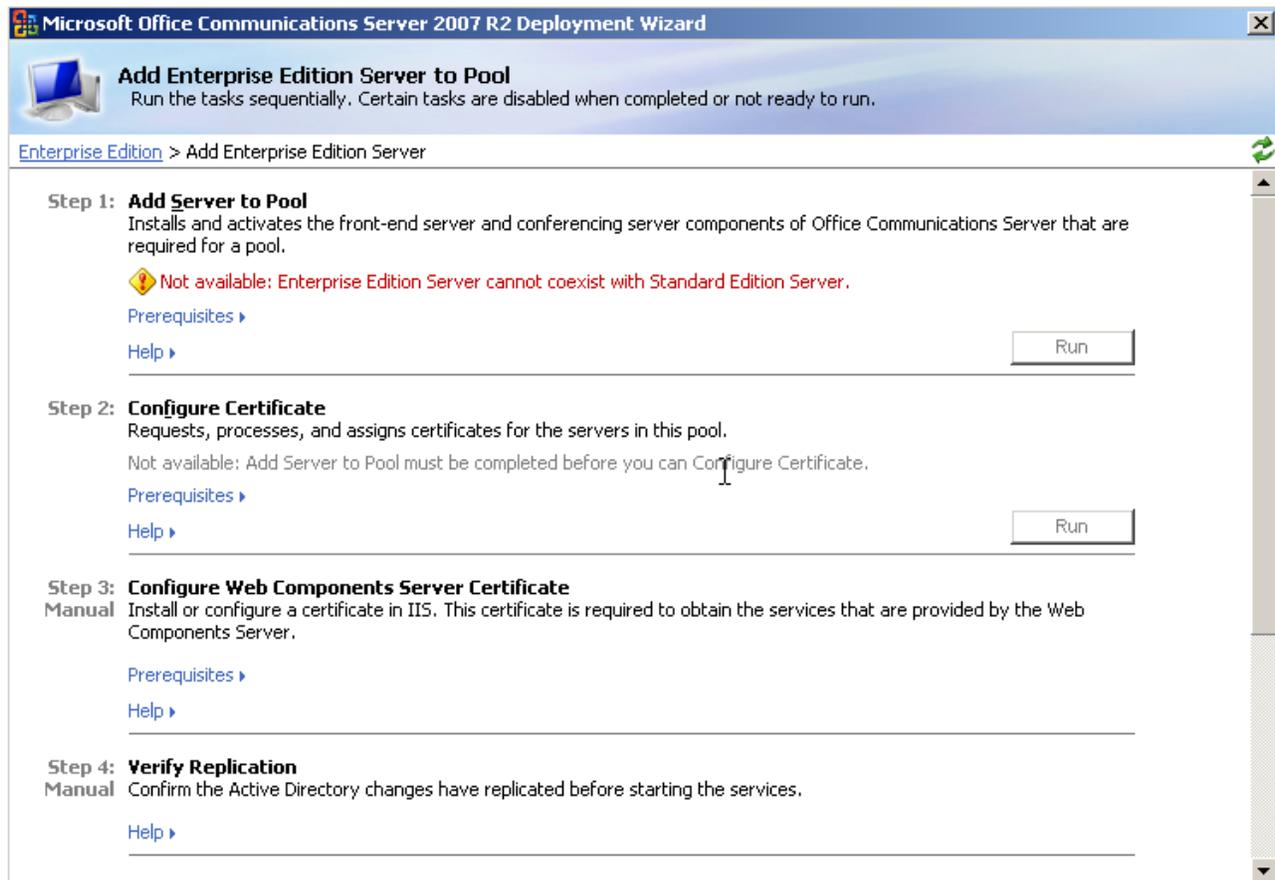

Figure 7 *Adding an enterprise server to the Office Communicator pool*

The next step in the installation is configuring the OC2K7 server as a front end server. The first step is to add the server to the pool. In this part the administrator is asked to reselect the SIP domain and insert the location of the pool, which is the SQL server and the instance dedicated to the Office Communicator services. IIS will also be installed on the server to allow for office communicator administrative tools to be used. Once the server has been added to the pool the administrator can configure a certificate so other servers can authenticate. The configure certificate option contains walkthroughs on how to configure it properly. For the prototype installation a generic certificate is used. The IIS service was installed on the server and an IIS cert was created to allow web server components to function.

The final step in the server installation phase, which is not shown in the figure above, is starting the services and verifies the services are running properly. Once the services have been started the administrator can validate every service that is currently running. There may be issues with the first validation which tests the IM login. Through research the best way to test if a user can log in and communicate with another user is to actually install the Office Communicator client on two machines and have the users log in. Validation of the other services can be done even if the first validation test fails. To add users the administrator must install the administrative tool and add an AD snap in to a Microsoft Management Console (MMC). Once added the administrator can SIP enables users.
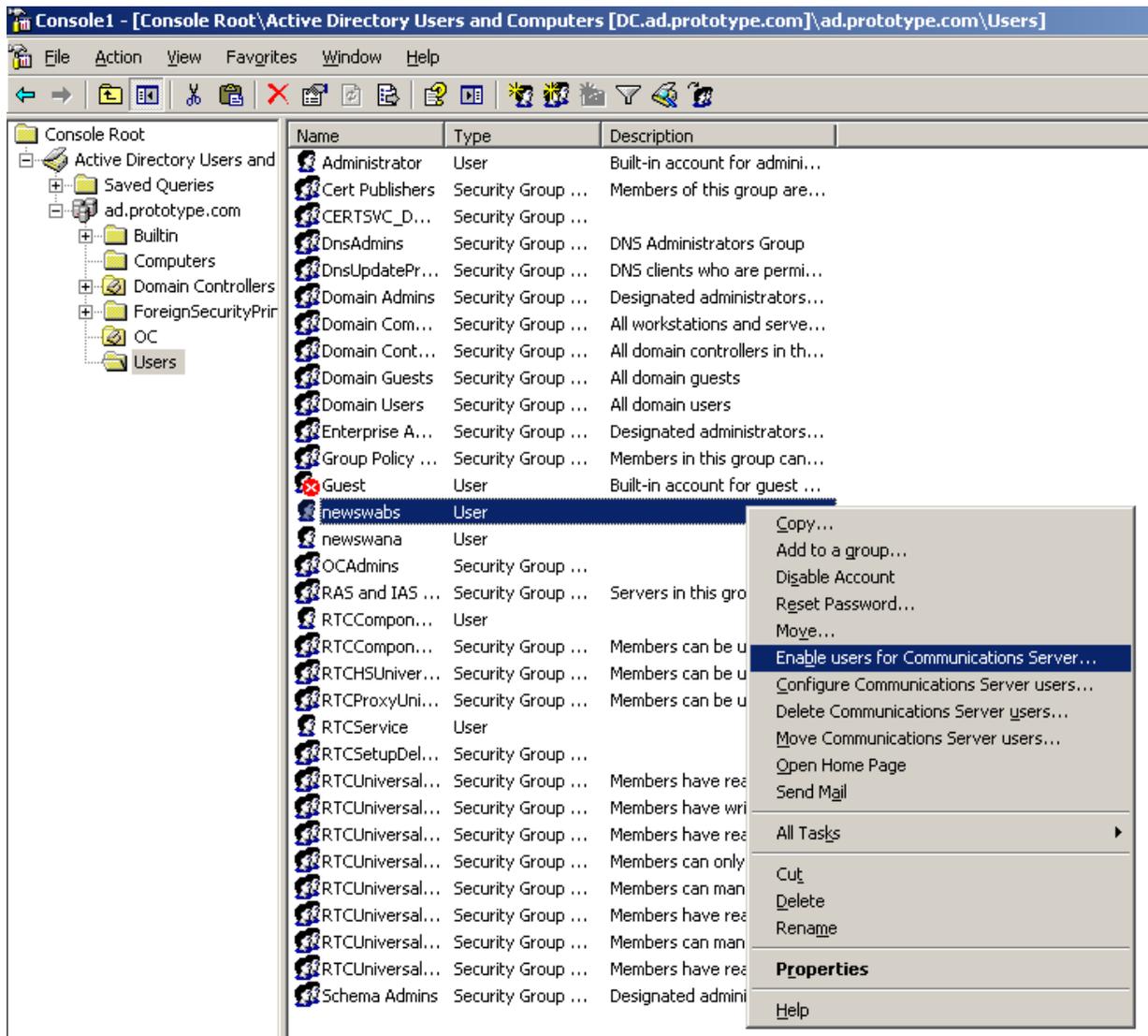
Figure 8 *Office Communicator Management tool with AD snap-in through MMC*

After the administrative tools are installed and an MMC is created and an AD snap in is added

the administrator is now able SIP enable users. To use the OC2K7 all users must be SIP enabled.

To enable SIP the admin must right click the user and select "Enable users for Communications

Server." After going through the short activation prompts administrator must decide how the

usernames will appear within IM client. Once all the options have been selected the username

will be SIP enables and capable of using the OC2K7 client software. Under IIS server

authentication options the administrator must select Windows Logon to allow automatic client
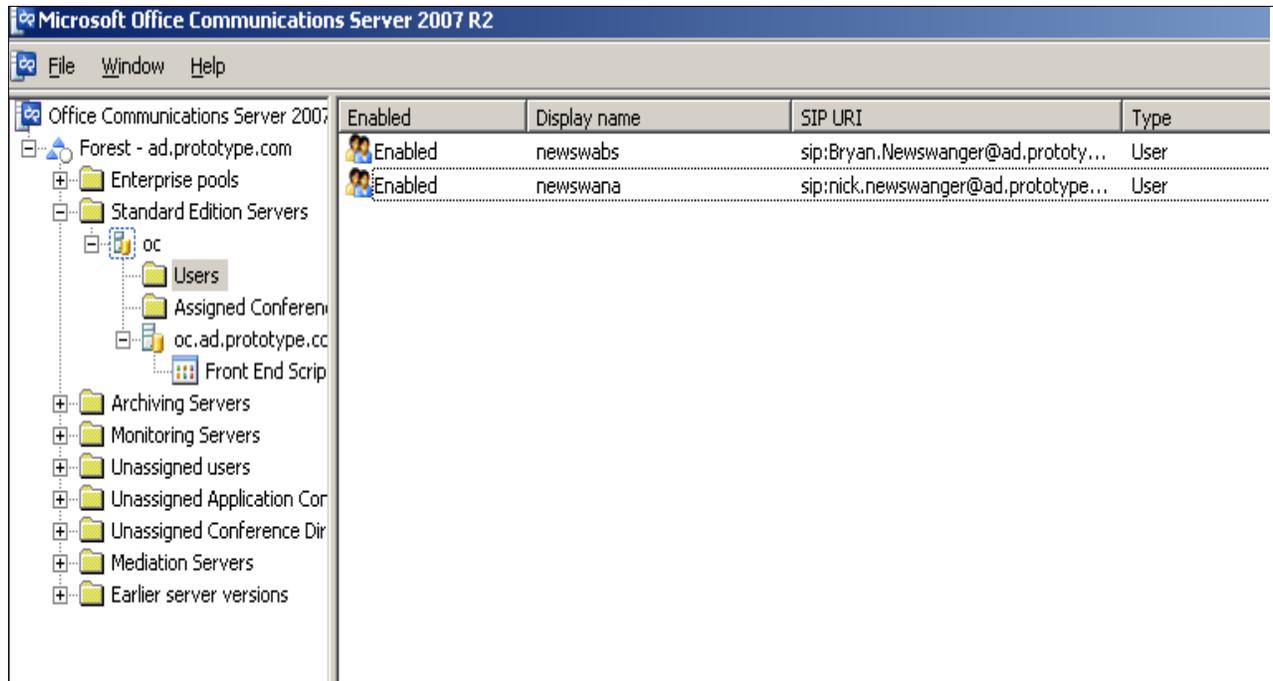
logins.

Figure 9 *Office Communicator 2007 Server R2 administrator tools*

Pictured above are the Office Communications Server 2007 R2 administrative tools. Here you

can see the servers installed and users which are SIP enabled. Within this administrative tool set

and administrators can make changes to the OC2K7 installation from a regular non-server PC.

The administrative tools are installed from the original OC2K7 R2 installation CD. The final

step is to install the actual client on a PC within the network. The administrator tool access is

configured during the pre-configuration step. The administrator installing the software will

choose a manually created AD group who will be given access.
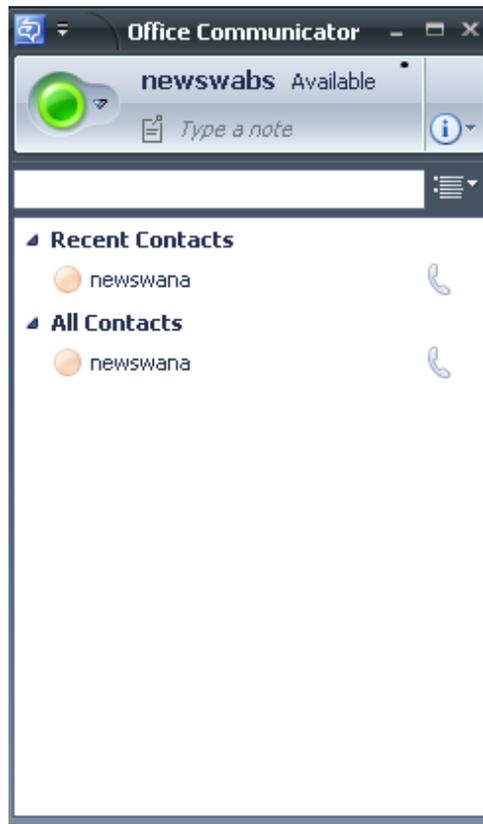
Figure 10 *Office Communicator client*

Once the client is installed on the machine users can now begin using the product. From this

screen users can add additional friends, configure level of access for individual users, start web

conferences, start audio/video conferences, and make a communicator calls which can be linked

to their phone. The login for the client is set to use the windows login. The users will not be

required to type in their password a second time adding some convenience

Testing Recommendations

To test the UC and voicemail software I will recommend the University create a pilot for both voicemail and UC products. Before the product is purchased the University will want to negotiate with the potential vendor to install a prototype that proves the product will work seamlessly on the Universities environment. UC can be a very touchy product, many case studies suggest that vendors will claim they work well with the other, but in actual use they do not. The UC side of the equation will be much simpler to test then the voice mail side.

UC is easier to test at the University because it will not make a noticeable difference to the network or live operations. Testing the UC product could be as simple as installing the software on the vendor hardware and deploying on the network for a few users. The IT department at the University will want to verify that all services run properly and that there are no issues. If there are issues the vendor can assist the University in either solving the error or determining if it is a project changing issue. In the event that UC is compromised the University should look to another product.

Voicemail will be harder to test because there is no test environment. Tom Ridgeway has said multiple times throughout vendor meetings and personal interviews that it is not simple, and can be dangerous, to test the system on the live network (16). To test the voicemail service I will recommend attempting to mimic the current network in a vendor lab. Some vendors are capable of doing this making it less intrusive on the live network. If this is not possible then a small pilot must be deployed on the live network using the vendor hardware and software to test. This can be risky but is better than a complete failure. A complete failure would be implementing the new

voice mail system without testing and seeing it fail bringing down the entire Universities voice

mail system. This would not be ideal.

Final Recommendations

Vendor Cost Analysis

Avaya					
	One Time	$312,580.00	modular messaging for 8000 users	$476,768.00	15,000 users
		$186,441.00	one-X Suite for 500 users	$186,441.00	one-X Suite for 500 users
	Ongoing	$86,053.00		$109,100.00	
AVST					
	One Time	$308,000.00	CallXpress 15,000 users		
	Ongoing	$50,000.00			
Cisco					
	One Time	$240,000.00	7,900 mailboxes + 100 unified	$368,000.00	14,900 mailboxes + 100 unified
	Ongoing	$63,000.00		$111,400.00	
Microsoft ***					
	One Time	?	$10 per FTE ? $135,000.00		
	Ongoing	?			
*estimated costs prior to any negotiations					
**this product is based on ports not mailboxes					
***costs not known					

Figure 11 Vendor Cost Analysis (*11*)

The vendor cost analysis above was used to determine the estimated cost for each project. The

costs above are pre-negotiation costs supplied by Diana Noelcke (*11*). Shown above are the

costs for Avaya, AVST, Cisco, and Microsoft. The cost roof Diana Noelcke has set for the

project is $600,000. The $600,000 UC budget was used to determine the final recommendations

in the end of this section. The costs that were used to determine the overall cost were the costs

located on the right side of the spreadsheet. The University maintains over 15,000 voice mail boxes making the costs on the right the correct ones to use.

Avaya's total cost for OneX, which is the UC suite, is $186,441, and the total cost of the voice mail system is $476,768. This comes to a grand total of $663,209 with an ongoing cost of $109,100. The initial one-time-cost estimates were above the initial budget set by Ms. Noelcke. The next product is supplied by AVST. AVST is strictly a voice mail and call processing product. If the University were to deploy AVST's CallXpress 8 it would cost $308,000 with an ongoing cost of $50,000. AVST's product is well within the budget, but only solves the voice mail side of the project. The final company to supply their costs is Cisco. Cisco initially would charge the University $368,000 for a onetime cost and $111,400 ongoing. Cisco is also well within the budget (11).

Both Avaya and Cisco costs will rise as more users are added to the service. UC cost increases as more licenses are purchased to supply the University employees, and students, access to the products. These costs will also be negotiated further as the project progresses into phase two. Microsoft did not supply any onetime costs. They were contacted the beginning of April 2010 and have yet to respond. AVST, Cisco, and Avaya all responded within a few weeks with their non-negotiated onetime, and ongoing, costs. The ongoing cost in the diagram above is only a guess at the actual cost from small bits of information gathered from the Microsoft vendor meeting. Microsoft was not considered as a viable choice because of this issue.

Vendor Scorecard

A scorecard was created to analyze all of the potential vendors for the University.

Unified Communications Score Card				
	Microsoft	**Cisco**	**AVST**	**Avaya**
Must Have				
Unified Messaging	✓	✓	✓	✓
VoIP	✓	✓	✓	✓
Aastra PBX Compatibility	✓	✓	✓	✓
Exchange Compatibility	✓	✓	✓	✓
Collaboration	✓	✓		✓
Sharepoint Compatibility	✓	✓		✓
IM	✓	✓		✓
Mobility	✓	✓	✓	✓
Presence	✓	✓	✓	✓
Fax	✓	✓	✓	✓
AD Compliant	✓	✓	✓	✓
Voicemail Capabilities	✓	✓	✓	✓
Mac support		✓	✓	✓
Wish List				
Social Networking Capabilities				
Distance Learning	✓	✓		

Figure 12 Unified Communications Vendor Scorecard (1, 2, 3, 5, 8, 9, 10, 15, 18).

The scorecard above was created using vendor power points, company websites, and vendor presentations. Each check mark states that this item is available with the vendor solution. The scorecard is split into two sections; Must Have and Wish List. The must have section are parts that must be available to the University.

AVST is strictly a voicemail company and does not offer a full UC system. Most scorecards are developed using a numbering system. UC cannot be graded; it can only receive either a yes or a no. To validate the scorecard a vendor analysis has been written for each column and check mark reasoning why the item was either checked or left blank. Please refer to Appendix A for the four vendor analysis documents. The recommendations below were created using the vendor analysis documents in Appendix A and the scorecard in figure 10 above.

Recommendation 1

The number one recommendation for the University of Cincinnati is an entirely Cisco based solution. A Cisco solution involves Cisco's Unity Connection and Call Manager 8.0. The Cisco Unity Connection 8.0 hardware and software will replace the current voicemail and Unified Messaging (UM) products at the University. The call Manager 8.0 software will replace the rest of the 3comm phone system. Call Manager 8.0 offers the required UC requirements for the University. The University requirements are shown on the vendor scorecard and detailed in the supporting documentation.

Cisco Unity Connection 8.0 will solve the voicemail and UM issues at the University. The current voicemail system is almost out of contract and needs to be replaced soon. Cisco Unity Connection will allow for an easy and cost efficient switch for the University. A scorecard was developed to analyze all the major vendors that have pitched their products to the University. Cisco fulfilled the required check marks, or "Must Have," requirements. Cisco Unity Connection will solve the UM, Aastra PBX compatibility, Exchange Compatibility, Fax,

Voicemail, Mac Support, and presence capabilities. The software offers up to 20,000 mailboxes, which is enough for the University at this time.

Cisco Call Manager 8.0 will handle the rest of the University's UC requirements. The University lacks a fully unified, UC, product. Users within the network use a variety of instant messaging (IM) programs and have very limited presence capabilities. Call Manager 8.0 will fulfill the VoIP, Exchange Compatibility, Collaboration, SharePoint, IM, Mobility, Presence, AD compliance, and Mac support requirements, as shown on the scorecard. Between Unity Connection and Call Manager, Cisco fulfills the Universities UC requirements. Distance learning capabilities are also available with Call Manager, which is located in the wish list section of the scorecard, and not required for the project. Wish list items are not critical to the project, so they do not need to be available with the products.

One of the most important requirements for the UC solution is mobility. Cisco offers an IM product that is capable of running on multiple smart phones such as; Blackberry, Windows Mobile, and IPhone are just a few. Greater mobility functionality offers more intuitive presence capabilities as well. Mobility was one of the key points brought up and various meetings and upper management. For more information regarding each individual check mark please see the scorecard documentation regarding Cisco's products.

Polycom and Elluminate provide the University with Telepresence and some Distance learning capabilities. The Polycom and Elluminate products will not be forced out, they are currently integrated well within the University and can be used alongside the Cisco products. Over a

period of time the Elluminate and Polycom software could be phased out and replaced by Cisco products. Cisco offers strong Telepresence technology as well as Distance Learning capabilities that can be integrated with Blackboard, the same way Elluminate is. Phasing out Polycom and Elluminate could result in a lower cost.

The most important part of the recommendation is the cost. Diana Noelcke has set the project budget at $600,000. To obtain all the hardware and software required for an installation of both Cisco Call Manager, and Cisco Unity Connection, come to a onetime cost of $368,000. Following the onetime cost is an ongoing cost of $111,400 a year. The onetime cost is well within the $600,000 limit set by the project lead. The remaining $242,000 can be used to cover two years of the ongoing cost. Cisco is not the most expensive solution either, Avaya, which is not part of any recommendation, was roughly $663,000 with a $109,000 ongoing cost. Cisco is almost half the price of a product that offers all the same capabilities.

Cisco is the best solution for the University at this time. The cost is well within the listed budget, and is at a 70% discount compared to the regular price. The Cisco products fulfill all of the requirements the University has, as shown on the scorecard. The Cisco products are also highly rated throughout the business world offering a sense of security and reassurance. Cisco also offers the most mobile capabilities over a wide variety of cell phone platforms, compared to Microsoft and Avaya.

Recommendation 2

The second recommendation to the University of Cincinnati is to create a hybrid between AVST and Cisco. AVST offers a product titled CallXpress 8 which is a UM, VM, and call processing product. Along with CallXpress 8, Cisco's Call Manager 8.0 will fulfill the remaining UC requirements. In this situation the CallXpress 8 software will replace the UM and voicemail products at the University and Call Manager 8 will provide the UC capabilities to the University. AVST does work with Cisco protocols allowing for a simple integration between the two products. AVST stated they are very flexible with multi-vendor businesses, which is very important for the University.

AVST's CallXpress 8 will fulfill the Universities voicemail, UM, Aastra PBX Compatibility, VoIP, Mobility, Presence, Fax, AD Compliance, and some Mac Support issues. AVST only provides a solution for telephony related requirements. AVST has been working with phone and Voicemail systems dating back to the 90's, and has a strong grip on the market. There are many Universities, government operations, and private businesses using their products. The scorecard and scorecard documentation support the claim that AVST is more than capable for solving the Voicemail related issues at the University. Licensing for AVST's CallXpress 8 is also slightly different than the competition. The licensing is based on the amount of ports on the PBX rather than the individual users. This results in an ongoing cost of $50,000. However, the onetime cost is $308,000 which is almost the same as the first recommendation using Cisco's Unity Connection and Call Manager.

Cisco Call Manager 8.0 will handle the rest of the University's UC requirements. The

University lacks a fully unified, UC, product. Users within the network use a variety of instant

messaging (IM) programs and have very limited presence capabilities. Call Manager 8.0 will

fulfill the VoIP, Exchange Compatibility, Collaboration, SharePoint, IM, Mobility, Presence, AD

compliance, and Mac support requirements, as shown on the scorecard. Between Unity

Connection and Call Manager, Cisco fulfills the Universities UC requirements. Distance

learning capabilities are also available with Call Manager, which is located in the wish list

section of the scorecard, and not required for the project. Wish list items are not critical to the

project, so they do not need to be available with the products.

One of the most important and repeated requirements is mobility functionality. Cisco offers an

IM product that is capable of running on multiple smart phones; Blackberry, Windows Mobile,

and IPhone are just a few. This capability offers more advance presence capabilities as well.

For more information regarding each individual check mark please see the scorecard

documentation regarding Cisco's products. AVST's CallXpress 8 also offers mobility through

voicemail as well. Users are able to listen to E-mail through their voicemail welcome menu

using any phone. Users are not required to use Smartphone's to deal with basic presence and E-

mail capabilities through the AVST CallXpress 8 software.

Polycom and Elluminate provide the University with Telepresence and some Distance learning

capabilities. The Polycom and Elluminate products will not be forced out, they are currently

integrated well within the University and can be used alongside the Cisco products. Over a

period of time the Elluminate and Polycom software could be phased out and replaced by Cisco

products. Cisco offers strong Telepresence technology as well as Distance Learning capabilities

that can be integrated with Blackboard, the same way Elluminate is. Phasing out Polycom and

Elluminate could result in a lower cost.

The most important topic is the budget. AVST's CallXpress 8 comes to a onetime cost of

$308,000 with an ongoing cost of $50,000 per year. This accounts for half of the $600,000

budget. This number, as stated earlier, comes only $68,000 short of the first recommendation.

The onetime cost of Cisco's UC products comes to $69,088. This comes to a grand total of

$377,088. The Cisco product in this instance only has licensing for 100 users. This value will

change as more users are added. The ongoing cost for Cisco Call Manager is dependent on how

many users are activated for it. The total value being $377,088 is comparable to the first

recommendation. The ongoing cost is going to be $50,000 + the amount of active Cisco UC

users. This cost is well within the budget making it a viable option.

AVST's CallXpress 8 with Cisco's Call Manager 8.0 comes in a strong second.

Recommendation one involved one company using two pieces of software that are for sure and

guaranteed to work well with each other. Cisco is also a major leader in both the voicemail and

UC field. AVST is a well known company with a strong voicemail system but the total onetime

cost is higher than the other companies. The University is not just looking for a voicemail

solution, but also a UC solution that works seamlessly. The voicemail cost totaling $68,000

lower than the entirely Cisco solution puts this recommendation at a strong second. However,

the Cisco UC offering added to the AVST voicemail cost comes to $377,000, which is

comparable to the total Cisco cost. The big issue with this option is that they are two different

companies. They claim they are robust enough to work with the other vendor, but, this will need to be proven through testing or case studies.

Conclusion

The research gathered and prototype used in this project will allow the University of Cincinnati to increase productivity and time management. The use of Office Communicator 2007 was not to push the product onto the University, but to fulfill the senior design prototype requirement. The final report to the University contained a scorecard scoring each vendor, documentation backing up the scorecard, and two final recommendations written to the University on which product to choose. These final documents will help the University choose the correct product to solve their UC needs. Successful deployment of UC at the University will increase overall productivity, collaboration, and time management.

Appendix A.

Scorecard Analysis for Cisco

This report is focused entirely on Cisco Unified Communications and Voicemail Products. Within this report is a response to every item within the Unified Communications score card created by me to analyze one of the four major contenders for the University. There will be three other similar reports with this document detailing out the other three companies. All information used for this report was obtained from cisco.com and a vendor meeting PowerPoint from Cisco. Cisco offers Unified Communications Manager for UC and Cisco Unity for voicemail capabilities. All information gathered in this report is from the Cisco vendor meeting and Cisco.com (5, 8, 18).

Unified Messaging (UM) is the first topic on the score card. UM is on the Cisco Unity 8 software supplied by Cisco. This software is compatible with both Exchange and IMAP based E-mail systems increasing the usability to all major email systems. Users are able to receive Voicemails to their E-mail clients, convert E-mails from voice to text, and alter their voicemail settings without using their phone. Cisco offers a wide variety of Unified Messaging options including Video messages as well. Depending on the Unity product deployed a few more options and tools can be implemented regarding presence and mobility. This item will receive a check because it fulfills all the business needs, for UM. The major focus of UM is the ability to receive voicemails as audio E-mails for convenient storage and the ability to forward. Both options are offered with the Cisco Unity 8 software (8).

VOIP is the next major topic on the score card. VOIP capabilities are required for the Universities future development. All companies are slowly integrating VOIP technologies and Cisco Unified Communicator offers these capabilities. Cisco Unified Communicator includes both UC and VOIP capabilities as well as a few other products. VOIP technologies can be configured within the call manager to use soft phones and regular phones. The program also links to the two together for added convenience and usability. The software is also easily scalable and simple to manage. The University currently maintains a small VOIP deployment and Cisco is capable of using the current hardware. If more business units are added to the University the system is robust enough to allow more connections by simply adding another server, if the current VOIP server is full. This topic will receive a check because it fulfills the basic VOIP needs of the University and allows for future development (8, 18).

During each vendor meeting the topic of PBX compatibility was brought up. The Cisco representative said that Cisco products will work on the Aastra Pointspan PBX as is but recommended slowly adopting a more IP based PBX in the future. They also claimed to have customers using Aastra products and have no issues configuring their hardware to work with it. Since they have claimed their product will work seamlessly I will place a check mark here. However, if this product is chosen it would be best to test the services before actually purchasing and deploying to double check the compatibility (8).

The next item is Exchange Compatibility. Exchange is the primary E-mail service at the University and the product must work seamlessly. Cisco Unity and Unified Communications products do work seamlessly with outlook as shown on their website documentation as well as

the vendor meeting. Some of the products supplied by Cisco will utilize Exchange and IMAP to supply UM and basic UC services. Cisco products are compatible with Exchange so this item will receive a check. Exchange is something that has an extremely low chance of being changed on the Universities network (8).

Collaboration tools are required to have a successful UC deployment. Collaboration tools include any tool that allows users to work together increasing productivity such as audio/video conferencing and web conferencing. Cisco offers Web-ex conferencing and audio/video conferencing to its customers. Web-ex works on all platforms as long as the user is using a supported web browser like Internet Explorer or Firefox which are the most common. The audio/video conferencing also allows the user to expand into conferences or just keeping it simple with one-on-one conversations. These are the major collaboration tools. There are other tools offered that can help the community as well but the web-ex and audio/video conferencing is suitable for the Universities needs. This topic has received a check because it fulfills all the needs (8).

SharePoint is a major part of the University and its future plans. Cisco Unified Communications and UM products are compatible with SharePoint according to Cisco documentation. Users are able to call other users via SharePoint utilizing the soft phones according to the documentation. This is very convenient and adds to the seamlessness of the project. Cisco has also been working to integrate more Microsoft Office products as well, many of which have already been completed. This item has received a check mark because SharePoint is integrated into the Cisco products (8).

The next subject is Instant Messaging (IM). Instant messaging is offered with the Cisco Unified communications suite. The product is called Web-ex Connect. The software integrates the collaboration tools listed above with IP telephony capabilities as well. Also included within the IM service are presence capabilities. Users can use the software to communicate with other employees on a secure and controlled environment. The product works on all platforms because it is web based. As long as the browser is supported it will work. The product supports both Internet Explorer and Firefox which are the browsers most commonly used. This topic received a check because it fulfilled the IM needs requirement (8).

Mobility is a major buzzword within the University and therefore a major topic of discussion. I have placed it as a requirement for any UC solution that is discussed. Cisco offers mobility capabilities for IPhone, BlackBerry, Nokia, and Windows Mobile Standard Edition. This is a wide variety of phones and Windows mobile and Blackberry phones are very common among employees within the organization. The service offers the ability to check voicemail; place calls using the enterprise network, and join audio portions of meetings with a single click. This does lack the ability to use the IM service through the phone which would be a hopeful integration later but still adds the mobility factor. Users are also able to do the basic mobility functions such as follow me technologies. This subject will receive a check because it supplies acceptable amounts of mobility (8).

Presence technologies are the next subject on the list. Presence is offered with the IM service with Cisco Unified Communications. The presence capabilities are linked to the user and do not

appear to link up with Outlook. Users will set their presence to help eliminate phone tag and wasted time tracking down fellow employees. Basic presence capabilities are fulfilled but seem to lack some innovative terms. The box has been check because presence capabilities are supplied that will be ok for the University (8).

Faxing capabilities are required for the University and will be replaced. Cisco's Unity software supplies faxing capabilities to replace the current 3com and other faxing systems. The service converts faxes into emails and also does fax to fax transfers as well. The box received a check because the faxing capabilities have been met (5, 8).

AD compliance is very important because the University uses AD for identity management. Cisco Unity 9 and Unified Communicator are all AD based products. The user information and authentication is all gathered from Active Directory. This part will work seamlessly and receives a check (8).

Voicemail capabilities are what Cisco Unity 8 is for. Cisco Unity 8 will supply all the necessary VM capabilities for the University. It is compliant with the Aastra PBX according to the Cisco representative and will work. This will be recommended for testing as well to make sure it works before purchase. Call attendant options are all available as well as call control and multiple number one voicemail boxes. All the basic voicemail functions are available with Cisco Unity 8. The product is also capable of handling all the voicemail boxes required by the University. There are also many more aspects to the Cisco Unity Connect that are not discussed

in this paper. This product will receive a check because all the basic needs of the University are met with no major issues (5, 8).

Mac Support is a major factor at the University. DAAP and CCM in particular are heavy MAC schools. Not have MAC compliant software can cause major issues. Cisco products are capable of working on MAC computers. The Web-ex technologies which is the key to using the IM services, conferencing services, and presence technologies are all web based and work with the popular browsers. This allows MAC and PC users to work together seamlessly, answering the Unified Communications issues at the University. UM services are also support on IMAP which is the E-mail service used by MAC. This will receive a check because the services are compliant with MAC (8).

The next two subjects are listed under the wish list. The wish list is a list of items I have deemed un-important to a successful business deployment. One such topic is Social Networking. Social Networking can be useful to a company to help integrate a business open society allowing employees to find information on another employee without having to chase leads and track down individuals to gather information just to chase another lead. Cisco Pulse is a social networking service offered by Cisco that focuses on helping users find experts. Cisco Pulse is an intuitive product that gathers information as it crosses the network to help update the service. This product is used to help link employees together to find experts faster and solve business issues. This would solve the social networking aspects of the University if it is deemed necessary. This can also be done on SharePoint but SharePoint must be manually updated.

Distance Learning is also a major subject at the University. Cisco Unified Meeting Place which is native to the Unified Communications platform has been used for E-learning according to a few case studies. If Elluminate is a product that will soon be removed then this product could be tailored to take its place. E-learning is a capability and has worked for other learning environments so it will receive a check. Before actual implementation it may be a good idea to test before purchasing the software.

Scorecard Analysis for Microsoft

This report is focused entirely on Microsoft Unified Communications and Voicemail Products. Within this report is a response to every item within the Unified Communications score card created by me to analyze one of the four major contenders for the University. There will be three other similar reports with this document detailing out the other three companies. All information used for this report was obtained from Microsoft.com and a vendor meeting PowerPoint from Microsoft. Microsoft offers two products to solve the entire Unified Communications (UC) and Voicemail (VM) issue. Exchange 2007, which is currently deployed, and Exchange 2010 both offer VM and UC service. The second product is strictly for UC, which is Office Communicator 2007 (9, 10).

The first talking point on the score card is Unified Messaging. Unified Messaging is included in Exchange 2010 to the fully expected capabilities. With Exchange 2010, the administrator can enable a user for Unified messaging allowing them to do three major things. The first thing they are able to do is alter their voicemail options through outlook. Users used to be required to alter their voicemail options through a third party program or telephone. The second item is the

ability to receive voicemails through E-mail. Users set up for this service no longer have to check their voicemail through their phone, they can store them on the server and simply listen to them through windows media player. Users are also able to forward the voicemails like any other email. Another capability is the ability to have voice-text for voicemails. This simply translates the voicemail into text for the user to read instead of listen (10).

Exchange 2007 offers the basics to unified messaging but lack a fully unified approach. Third party programs are required to alter the message waiting indicator. Third party programs are also required for other major parts to the 2007 deployment. For a fully unified approach 2007 should not be used as the solution. It could possibly be used as a patchwork fix until exchange 2010 can be installed on the network. Exchange 2010 earns the checkmark for unified messaging but exchange 2007 would not (10).

The next talking point is IP telephony. Microsoft Office Communicator 2007 offers VOIP capabilities to users who are enabled to use the Office Communicator product. Users are able to make calls from their desktop using a headset and mike to communicate. These calls are made across the network using the instant messaging program as the catalyst. Users can simple right click another user within the network and place a VOIP call. Users can also make the call on the soft phone but have it ring their hardwired line or cell phone instead using rich VOIP features. These capabilities will be sufficient for the University so it has received a checkmark. The products offer VOIP capabilities within a reasonable standard (9).

One of the major requirements is compatibility with the Aastra Pointspan PBX. This is a must

and a deal breaker. Compatibility testing for this project has been done with the individual

companies. During vendor meetings each company has been questioned on their compatibility

with the Aastra PBX.   During the Vendor meeting they expressed the Office Communicator

software and the Exchange 2010 software will work with the Aastra PBX. Microsoft claimed

their hardware is open enough to work with most PBX based systems but they highly

recommend migrating to VOIP. Migrating to VOIP completely is not within this project scope

however VOIP capabilities are (10).

For this next section I will skip a few to focus on Exchange email compliance and SharePoint.

SharePoint is further down on the checklist but is a Microsoft product as well. The UC solution

provided with Microsoft Office Communicator 2007 works with both Exchange and SharePoint

seamlessly. Within the web deployment of Office Communicators administrators simply have to

tell Communicator that SharePoint is available to get the ball rolling. Exchange is also a strong

catalyst for the entire Unified Communications solution. Outlook 2k3, 2k7, and 2010 all work

with Office Communicator 2007. SharePoint services can be connected with presence

information as well (10).

The part of the UC puzzle which was skipped is the collaboration section. UC requires

collaboration to be easier and more efficient to support the overall model and desire. Office

Communicator offers audio/video conferencing capabilities for one-on-one meetings as well as

Windows Live meeting which is a larger conference style meeting. Each of these products

solves the collaboration issues at the University. There are also solutions in place but may not be

compatible with the newer UC solutions but are capable of being replaced by a more convenient product. I believe the conferencing capabilities of Windows live meeting will fulfill the same intentions which Polycom solved (6).

Instant messaging is a key component for all four companies. Instant Messaging (IM) is also a key part to any UC solution. Office Communicator 2007 offers Office Communicator messenger as the solution. The messenger program is a basic IM program that allows the user to instantly initiate live meetings and audio/video conferencing. Presence is also part of the office communicator messenger program as well. The office communicator messenger also offers a way for users to view other user's profiles to gather information on what that person exactly does. The Office Communicator messenger gives the product IM capabilities earning the check (9).

Mobility is an important topic, and big buzzword, in business today. Office communicator offers mobility for only windows based Smart Phones. Microsoft also offers API development kits to create apps to expand the mobility profile. I gave a check for this on the chart because they do offer working mobility options for some features related strictly to Office Communicator. However, on the UM and E-mail side there are mobility options native to Exchange 2010. Users are able to handle E-mail through voicemail eliminating the need for smart phones and users can easily transport voicemails without having to log into the system with their phone. This adds a much more rounded out way to deal with communications involving voicemail and email. Mobile apps are a major downside but are still provided earning the check mark. Personally I

would like to see more integration of non-windows based products to create a much more robust and expansive product solving all business needs rather than selective as is now (9).

Presence capabilities are available with Office Communicator 2007. Presence is strictly on the IM program, without the IM program there is no presence technologies. Presence can be set to auto-update using the Outlook calendar. Users can also customize their presence but can only have four custom presences set. Users are also able to auto-set their presence to let users no when they are mobile or not by just activating Office Communicator on their windows mobile device. Presence allows a user to let other users know the best way to contact them, if at all. This item has received a check because it fulfills the presence needs. Users not using the Office Communicator messenger can still use pseudo-presence, which is basically using away messages to let people know what's going on (9).

Fax capabilities are native to Exchange 2010. The servers are capable of detecting the incoming fax and converting them into emails reducing the need for actual fact machines. Regular faxing can also be done in the system but is not as green or efficient. Many business units within the University still use faxing so it is a requirement for the project solutions. There is faxing capabilities with Exchange so this has received a check mark (10).

The second to last required object is AD compliance. Microsoft Office Communicator is obviously compatible with base windows identity systems. There will be no issues with AD and Office Communicator. However, AD schemas will need to be altered to allow Office Communicator to install properly but this should not be a major problem. Most major Microsoft

programs require schema alterations such as Exchange, which is already installed on the Universities network. This item has received a check (10).

The final required piece is MAC compliance. The software must work with MAC because many business users, Colleges, and students use MAC. This is going to be a major issue with Microsoft. MAC users are required to use MAC messenger instead of a Microsoft product which lacks all the same features as Office Communicator's messenger program. They are still able to conduct audio/video one-on-one conferencing but using Windows Live meeting is not seamless. During the Microsoft project pitch they speaker insisted it would work but takes some fine tuning. To me this is not acceptable, there are quite a few MAC users on the network and having to tweak everyone's machine is unreal. Most of these are private owned and not the Universities property. This could prove to be a major support issue. Windows Live Meeting is a major part to the UC puzzle. This item did not receive a check and could be a deciding factor.

The Wish list includes pieces to the UC puzzle I have deemed unnecessary and non-project changing. These items can be left out of the project and not have any lasting effects to the University (9, 10).

The first item on the Wish List is social networking. Microsoft does not offer a product like linked in or Facebook that can be used by the University for personal, social networking. Many businesses in the US use Linked in to share within their organization. These programs are used to detail out a person's work experience to help new or existing employees find the right person through a simple search without having to spend all day tracking someone down that might know

it. This item did not receive a check because there is not a product offered that focuses on Social Networking.

Distance learning is a major topic for the University but not a major issue with Unified Communications. Windows Live meeting could be used for distance learning capabilities but is not designed specifically for that reason. I have given a checkmark for this topic because Microsoft claims live meeting can be used for this topic. Already deployed at the University is Elluminate which is specifically designed for distance learning. I have given Microsoft a check mark.

Scorecard Analysis for Avaya

This report is focused entirely on Avaya Unified Communications and Voicemail Products. Within this report is a response to every item within the Unified Communications score card created by me to analyze one of the four major contenders for the University. There will be three other similar reports with this document detailing out the other three companies. All information used for this report was obtained from avaya.com and a vendor meeting PowerPoint from Avaya. Avaya offers Avaya Aura which is the Unified Communications system and Avaya One-X (1, 2).

The first talking point is Unified Messaging (UM). Avaya offers UM abilities to convert voicemails to audio emails and audio to text translations. These abilities are pretty much industry standard when it comes to UM. These abilities are available with the One-X voicemail software. Unified messaging for Avaya seems to be only exchange based and Lotus notes. This item has received a check because it does supply the abilities of UM (1).

VOIP capabilities are available with the Avaya Aura software. The hardware and software supports a VOIP infrastructure which is a requirement for the University. VOIP capabilities are offered the by the Communicator server and hardware with the Avaya products. All basic VOIP functionalities are available as well. There may be some compatibility issues that may need to be addressed if this vendor is chosen. The vendor focused a lot on a forklift upgrade which is not viable. However, this item has received a check because it fulfills the ability to support the hardware currently used on the Universities network (1).

Aastra PBX compatibility is a major concern with the Universities voicemail and UC deployment. Avaya focused heavily on attempting to convert the University to their supported PBX which is not acceptable. However, they did specify that their product could work with the Aastra PBX. This must be verified before any further action is taken with the Avaya products. Because the company claims it will work I have given the box a check mark (1).

Exchange compatibility is a must for almost all businesses, including the University. The University uses Exchange for faculty email services. Throughout the documentation listed on the Avaya pages they constantly mention their ability to link up with the Outlook calendar for presence management and the ability to send voicemails through the Exchange system. Exchange is a main part of the Avaya product so I have given this subject a check as well (1).

Collaboration tools are a major piece of the UC puzzle. Avaya collaboration tools include only Avaya One-X Portal. This is a tool that can be launched with a single click to help employees

collaborate on a project. The One-X Portal is a product that requires no installation on client machines. It is a web based program where users log in and contains conferencing, telephony, Instant Messaging (IM), and a few other services. They also push their ability to work with other communications products like Office Communicator and Cisco. Collaboration tools have received a check because they are offered (1).

SharePoint compatibility is a must for the University. Many of the new goals and missions within the University appear to focus around future SharePoint development. Avaya does offer seamless integration with SharePoint. Users are able to click and call a person using VOIP services. They are also able to see the up loaders presence information to aid in contacting that person. The SharePoint capabilities are not just limited to this but the main points are the two stated above. This does show SharePoint integration and earns a check mark for this area (1, 2).

IM is a major part of any UC deployment. IM is offered through Avaya's One-X software. The program is web based and is integrated with the conferencing, IP telephony, and presence capabilities. Users are able to open messaging sessions with other employees, search other employees, and escalate simple IM conversations into a conference allowing them to easily add new participants. This item has received a check because the basic IM services are supplied with acceptable additions and capabilities (1).

Mobility is big talking point for the University and a major part of the project. Avaya offers mobility for all phones with their One-X software. They claim they are able to work easily with all smart phone and blackberry services. It is not listed if Droid is supported but Droid is a

newer standard and not considered mission critical. Mobility options also include access to E-mail through the voicemail auto-attendant which is provided by the software. Mobility services are offered and are wide spread over the various phones earning the product a check (1).

Presence is the ability to see another employee's current status to decrease wasted time trying to find or contact a fellow employee. Avaya offers basic presence services through away messages, SharePoint integration, and the IM service will check the availability with Exchange and Lotus Notes products to help update presence information. Presence is offered with this product and other features may be available as well within the suite but not listed on the initial documentation provided. This topic has received a check because basic presence technologies are supplied (1, 2).

Faxing is a requirement for legal reasons and is important for the project. Faxing can be done with the Avaya software by using a simple wizard. Faxing is done using SMTP services and the use of network printers. Faxes can also be configured through Exchange and Lotus accounts as well. All basic faxing functionalities are also available for legacy needs. This part received a check because of the above reasons (1).

AD compliant software is required as well. The Avaya products are AD compliant. The modular applications offer the ability to authenticate against AD and Exchange. The Avaya Aura system manager also synchronizes with AD proving the product is AD compliant. This has AD compliance so I have checked the box (1).

Voicemail is a must for the project to succeed. Avaya does offer Voicemail capabilities with their One-X and Aura products. Users will get the basic Voicemail functionality with auto attendant features as well. With the voicemail come UM capabilities as well. Avaya offers the products necessary for the University to fulfill its voicemail needs and will receive a check for this part of the score card (1).

Mac support is important for this project as well. In the Avaya Aura and One-X documentation they mention MAC OS 10 is supported by Avaya products. Products before OS 10 may not work properly and are of course not supported. This proves that Avaya does support MAC based products earning a check (1, 2).

The wish list components both did not receive check marks because products fitting those descriptions were not found on the Avaya product lists. There are no Avaya specific Social Networking or Distance Learning capabilities available from the company to the customers.

Scorecard Analysis for AVST

This report is focused entirely on AVST call processing and voicemail system. Within this report is a response to every item within the Unified Communications score card created by me to analyze one of the four major contenders for the University. There will be three other similar reports with this document detailing out the other three companies. All information used for this report was obtained from avst.com and a vendor meeting PowerPoint from AVST. AVST offers CallXpress 8 which manages voicemail and call processing services. AVST does not offer a full

Unified Communications suite like the other three companies. Their primary focus is call processing and voicemail (3, 15).

Unified Messaging capabilities are required for a successful deployment. AVST offers Unified messaging to the extent that the University would like. What I mean by this is the University would like to receive voicemails in their email inbox while also being able to convert those voicemails into text. These are all capabilities of the CallXpress 8 software supplied by AVST. AVST offers the Unified Messaging (UM) that the University requires so they will receive a check for this part of the score card (3, 15).

The next topic is VOIP. VOIP is a major part of the Universities future and they do want to be able to expand what they currently have while also maintaining their current environment. AVST, during the vendor presentation, claimed that they would be able to easily integrate all the parts of the University that are VOIP and non-VOIP technologies. They claim they are very flexible with environments and design their products to work in that fashion. The call processing software can handle both PBX and VOIP calls allowing for the use of VOIP technology. This part will receive a check because the needs of the University will be met (3, 15).

The software AVST supplies must also be compliant with the Aastra Pointspan PBX. If the software does not work then the implementation will not work. During the vendor presentation it was learned that Aastra is partners with AVST and guaranteed us that the product will work seamlessly and the integration will be smooth. They have been partners with Aastra for a while and their products will work. Testing cannot be done on the PBX because it is an always live

product. This box will receive a check because the companies are partners guaranteeing that their software will work together. Having the PBX supplier and call processing/voice mail companies as partners of one another adds an extra calmness to the final product as well (3, 15).

The University primarily uses Exchange for their E-mail services and the new software must be able to use Exchange seamlessly. AVST primarily uses Exchange and IMAP services to transport the voicemails to email. Secure IMAP is also in a future release later this year, according to the AVST representative. This section received a check because it is capable of using exchange services (3, 15).

The next three sections have been left unchecked because they do not apply to the AVST software package. The sections skipped are; collaboration, SharePoint compatibility, and Instant Messaging. These services are focused more towards Unified Communications rather than voicemail and UM (3, 15).

The next section is mobility. Compared to the other three products, AVST only offers some mobility capabilities. Only a few are fulfilled because the software is not a full UC suite. What AVST offers is the ability to alter E-mails through the auto-attendant feature of the voicemail system. Users are able to use non-smart phones to check emails and forward emails from their accounts. Other mobility features offered are the ability to have a single voicemail account for all your phones and the ability to have calls follow you by ringing your cell phone when you are not at your desk. A check was placed in this box because some mobility features are offered but not to the extent of the other three projects (3, 15).

Presence capabilities are very important for the project. AVST offers a small amount of presence capabilities. Users are able to update their auto attendant to block calls or filter calls depending on the availability of the person. If a user is too busy to be bothered by a normal phone call the auto attendant feature can let the caller know of the situation. The caller can then leave a simple voicemail or just hang up. The auto-attendant will notify the owner that a call was blocked and later remind the owner to contact the caller if a call has not been placed in a specific time span. This is only a small section of presence but fulfills some needs. A check has been placed in the box because presence capabilities are offered for what the software is (3, 15).

AVST offers faxing capabilities with their software. Faxes can either be received in a normal fax machine or converted into an email and sent to specific E-mail boxes designated by the administrator. This box has received a check because the University will be able to fax properly without any issues. The migration will be seamless as well according to AVST (3, 15).

AD compliance is very important for the solution. AVST is AD compliant and can use AD to authenticate. During the vendor meeting we were informed that the software is AD compliant and will be a seamless integration. This box has received a check because of the above information. AD compliance is pretty straightforward and an industry standard at this point (3, 15).

Voicemail is a major part of this project. AVST CallXpress 8 offers voicemail capabilities to the user with many added features including UM, Auto-attendant features, and notification services.

The voicemail software will work seamlessly with the current architecture. The University is looking for a new voicemail system that is compliant with the current University tech stack to help lower the overall cost of the project. CallXpress 8 will fulfill the need the University is trying to fill while doing it seamlessly. This box has received a check because the CallXpress 8 main functions are voicemail and call processing services (3, 15).

The final major point is MAC support. The CallXpress 8 software supports IMAP email protocols which are prominent with MAC based machines. CallXpress 9 will include Secure IMAP support which is required by the University. Currently users on a MAC will not be able to gather their voicemail in their E-mail client until release 9. The box has received a check because it has MAC support and there is already development in place to fix the issue. The release will be out soon, before the UC project is actually deployed within the University. The wish list points are not applicable to this software and have been left blank. Social Networking and Distance Learning are not available through AVST's product suite (3, 15).

Notes

Work Cited

1. Avaya Vendor Meeting. 7 Jan. 2010.
2. Avaya. Web 4 April 2010. <http://www.avaya.com/usa/?CMP=KNC-nausggbrbr&HBX_PK=avaya&HBX_OU=50>.
3. AVST. Web 4 April 2010. <http://www.avst.com/>.
4. Caron, Eric. Voip-Info.org. 5 June 2005. Web 21 Feb. 2010. <http://www.voip-info.org/wiki/view/ITU+G.711>.
5. Cisco Unity Connection. Web 4 April 2010. <http://www.cisco.com/en/US/products/ps6509/>.
6. Elluminate. 10 March 2010. Web 20 Feb. 2010. <http://elluminate.com/>.
7. Gechter, Jerry. "Understanding Presence Technology." Web 20 Feb. 2010. <http://searchunifiedcommunications.techtarget.com/tip/0,289483,sid186_gci1294679,00.html>.
8. Kroger, Dave and O'Malley, John. Cisco Vendor Meeting. 8 Feb. 2010.
9. Microsoft Office Communicator 2007 R2 Product Overview. 10 March 2010. Web 20 Feb. 2010. <http://office.microsoft.com/en-us/communicator/HA102037151033.aspx>.
10. Microsoft Office Online. Web 20 Feb. 2010. <http://office.microsoft.com/en-us/communicator/default.aspx>.
11. Noelcke, Diana. E-mail Interview. 29 April 2010.
12. Noelcke, Diana. Personal interview. 23 Nov. 2009.
13. Noelcke, Diana. Personal interview. 28 Jan. 2010.S
14. Rainwater, Don. E-mail interview. 18 Feb. 2010.
15. Ready, Dick. AVST vendor meeting. 4 Jan. 2010.
16. Ridgeway, Tom. Personal interview. 15 Jan. 2010.
17. Shudnow, Elan. "Office Communications Server 2007 Enterprise Deployment – Part 1." 5 Jan 2009. Web 10 Feb. 2010. <http://www.shudnow.net/2009/01/05/office-communications-server-2007-r2-enterprise-deployment-part-1/>.
18. Unified Communications. Web 4 April 2010. <http://www.cisco.com/en/US/netsol/ns151/networking_solutions_unified_communications_home.html>.
19. Woodard, Jason. The GSM Codec. University of Southampton. Web 21 Feb. 2010. <http://www-mobile.ecs.soton.ac.uk/speech_codecs/standards/gsm.html>.