Soothing the Many-Headed Beast:
How to Support Everything with Limited Resources

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Abstract
With 30 years of experience, Virginia Tech’s 4Help provides 24x7 support for students, faculty, staff, alumni, and distance learners. To support an ever-changing technology base, 4Help brings together university groups, vendor resources, and homegrown solutions. Explore 4Help’s support model, including the call center, helpdesk, KnowledgeBase, and residential programs.

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Located in rural southwest Virginia, Virginia Tech is a large (the largest in Virginia) land-grant research institution heavily entrenched in science and technology (see Table 1). Because of this, the need for IT support developed early. Virginia Tech’s 4Help has a 30+ year history of providing technical support to faculty, staff, students, alumni, and other university affiliates (see Table 2).

Over the years we have been forced to change strategies, goals, and business processes to keep up with changes in technology and the computing infrastructure at Virginia Tech. Perhaps the single greatest challenge we have faced has been the shift from mainframe computing with dumb terminal access to a client-server environment. In the mainframe world we provided support only to faculty, staff, and graduate students for a small subset of computing applications. Now, however, we provide support to all university affiliates, including alumni who use our network for e-mail and online courses. Because we have a computer requirement for all incoming freshman, practically every student at Virginia Tech uses a computer daily and expects support for their computing needs. Because we now work with a client-server model, our boundaries of support can’t be defined by a simple list of products and applications. In order to respond to the demand for more support for a more diverse computing environment, we have shifted our operational strategies and business practices so that we support virtually any product our customers are using. This doesn’t mean that we provide in-depth support for every product. This doesn’t mean that we have a group of well-trained monks who diligently create documentation for every obscure program. What it means is that we have created a model that is informed by and responsive to our customers computing needs. What it means is that rather than train our staff to be specialists, we mold them into generalists who know where to go for answers. In essence, we are information brokers or reference librarians, linking our customers to solutions.

Our model is defined by a set of business processes that allow us to rapidly identify customer needs and provide support and documentation for those needs. The best part of the model is that it is set up to learn. What started out in 1969 as a simple helpdesk that provided support and documentation for a limited set of products has grown into a larger framework of services that are structured to shorten customer time on call, move answers to the web for self-service, and drive down the overall operating costs of the organization. In order to create such a responsive organization, we identified and designed multiple groups to provide a variety of services and resources to the computing population. Our services include a centralized call center that answers phones and routes trouble tickets for multiple support groups, helpdesk consultants, an online presence and KnowledgeBase documentation group, onsite service personnel, and product developers who create applications that allow our customers to get connected and stay connected to the network. We realize that our university may have more funding than many smaller institutions. Because of this, we suggest that nobody take our ideas as prescriptive. Rather, our successes should only stand as examples of individual solutions to a set common problems faced by many organizations. In order to be truly successful, each institution must tailor its own solution to its own list of understood problems.
The Pieces of the Model:

In order to provide the highest quality support for the lowest possible cost, we have divided our support group into targeted, individual pieces, each solving a core set of problems. Our major components, as represented in Figure 1 and Figure 2, include:

- The call center
- The helpdesk
- The KnowledgeBase
- Software initiatives such as VTnet (not shown on Figure 1)
- Targeted onsite student support

The Call Center:

The call center helps avoid customer confusion by providing a 24x7 single point of contact for technical issues. The call center is empowered to provide direct support for a variety of common and quickly solved problems, including general password resets and notification of system outages. Moving these key services to the front of the organization has helped decrease the number of calls transferred to second and third level support personnel, allowing such higher paid consultants to provide dedicated in-depth support to customers who have questions of a more technical nature.

When a customer calls for support that the call center cannot provide, a trouble ticket is created and routed to the appropriate support group (see Figure 1 and Figure 2 for detail). Because we work with a call back model, our customers are not required to wait on the phone for the next available consultant. They are informed that they will be called back as soon as a consultant is available. This call back model has increased productivity at the university, because customers can continue with their normal business while they wait for assistance.

The call center handles an average of 2,600 calls/month with a peak of 8,200/month during the fall move-in period. Of these calls, the call center operators provide immediate solutions to 45%, thus reducing the number of calls routed to the helpdesk or other support groups. The call center is staffed by 2.5 operators during the day shift, 1.5 during the evening shift, and 1 during the night shift.

The call center provides partner call routing for several key support organizations at Virginia Tech, including Information Resource Management (IRM), the group responsible for authentication and account creation for many systems; the Institute for Distributed Distance Learning (IDDL), the group responsible for distance learning applications and programs; and the Alumni Association.

The Helpdesk:

The 4Help helpdesk is only one of many support groups at Virginia Tech. Though probably the largest in terms of staffing and volume of calls, helpdesk management is dedicated to partnering with other support groups on campus to create a model that strives to be better, faster, and cheaper. Through their efforts, staff members have come to value two key components of the model:

- A centralized call center to route calls to appropriate groups. This has been described above.
- A single problem tracking system (Peregrine Service Center) to provide ticket routing and statistics gathering.
The single problem tracking system has provided faster transfer of problem tickets between groups. This not only allows for data and statistics gathering, but also provides faster call resolution for customers and reduced operating costs for partnering support organizations.

As stated earlier, 4Help no longer supports a specific list of hardware and software applications. This means that 4Help strives to provide assistance with any technical problem a customer may encounter. This vast undertaking has required a change in the cultural mindset of helpdesk employees. In this answer-driven model, technical support constantly adapts to customer demand. Consultants act as information brokers who attempt to connect users with solutions even when the technologies involved are still emerging in the marketplace. Sometimes technical agents are able to provide an in-depth step-by-step solution to a problem. When this is not possible, the agent provides contact information to connect the customer with more qualified support. When emerging products become everyday applications for our customers, we respond by providing training to our staff and creating documentation in our KnowledgeBase.

In addition to the flow of knowledge to the customer, knowledge also is constantly flowing into the KnowledgeBase. If a customer has asked a question that is not in the KnowledgeBase and can usefully be added, the consultant is required to document the information so that it can be included. This helps broaden documentation to reflect the kinds of questions that customers are asking and ensures that the KnowledgeBase is not filled with solutions to problems that are not of value to the customer base.

4Help realizes that normal 9-5 hours don’t provide adequate support for everyone. Because of this, the helpdesk hours have been extended to give computing support Monday-Thursday 8 a.m.-8 p.m., Friday 8 a.m.-5 p.m., and Sunday 5 p.m.-9 p.m. The helpdesk answers an average of 110 questions/day, although during fall move-in the questions peak at 350/day. The average response time for a return call is 20 minutes, although this number is higher during peak season.

The helpdesk usually maintains one supervisor and four student consultants on duty at all times. The supervisor is pulled from a pool of full-time employees in the 4Help department. Each supervisor works at least one four-hour shift per week. By rotating full-time staff through the daily work schedule, the consultants get the value of learning from the expertise of a wide variety of supervisors. The supervisors get the benefit of keeping abreast of the common questions that customers are asking. The customers get better trained consultants.

The KnowledgeBase:

4Help has always been in the business of creating documentation. As early as 1969, staff members created manuals for using mainframe applications. Starting in 1989, 4Help generated technical articles for internal use by helpdesk support staff. By the late 1990s, it became apparent that the creation and maintenance of internal documentation, although valuable, was costly and did not represent the best use of resources. In February 2000, a new project began moving informational and support resources directly to the web for public use.

Building the KnowledgeBase has not been an easy process and has required committed resources and staffing. To coordinate the effort, one person was assigned full-time to lead the KnowledgeBase project. Because employee support was identified as key
to success of the project, KnowledgeBase submission and review became an integral part of the consulting workflow. For all incoming support requests, consultants were required to check the KnowledgeBase for an appropriate solution. If that solution did not exist, they were required to compose and submit it immediately. Student helpdesk consultants were at first resistant to the change in process, but now realize the benefit of creating and maintaining KnowledgeBase articles for public and customer support use. Helpdesk supervisors have acknowledged that new consultants are providing productive work sooner, because many of the questions are in the KnowledgeBase.

We work in an environment where everyone understands, supports, and uses the KnowledgeBase daily. Questions of technology and infrastructure were avoided for the first year. The first part of the project used simple technologies with which everyone was familiar. These included web forms for submission and e-mail to provide a collaborative environment for knowledge sharing. New articles were submitted for publication, edited by the KnowledgeBase manager, and published to the web as flat files. Because the sheer volume of knowledge submissions demanded it, by February 2001 the knowledge group grew to one full time employee and three part time employees. In May 2001, the knowledge group added another part-time employee.

In an effort to track the internal use of the KnowledgeBase, the helpdesk consulting staff was required to mark whether the problems they solved were found in the KnowledgeBase. As use was tracked and statistics demonstrated that answers were being used by consulting staff (an indication that they were finally accepting the KnowledgeBase as a viable mechanism for support), it was obvious that a system with a database back-end and better usage gathering mechanisms was necessary. Throughout the project, the KnowledgeBase manager performed intensive research about knowledgebase creation and the many products available and compiled a list of desired features. After deciding that no product on the market met the needs of our organization, the KnowledgeBase manager, in cooperation with other partnering departments, worked from March 2001 through August 2001 developing a system with a database backend allowing for better data gathering and statistics generation.

The KnowledgeBase project is relatively new. We are still in the process of refining the statistic gathering functions and are still courting many partners at the university. We currently provide editorial and publishing services for five groups external to the helpdesk and KnowledgeBase team. By publishing their solutions in our online database, we are able to move answers closer to our customers and help these groups offload calls that would have been directed to them. Although interest from outside groups has been high, their commitment to the project has been low. We are finding that the same cultural pitfalls we experienced in our own department exist in our partnering departments as well. However, because we are able to show them hard usage statistics (our KnowledgeBase provides direct answers to over 25% of the support calls the helpdesk receives), our partnering departments are taking notice. Their support and participation can only provide a win-win solution. Customers will receive support more quickly and the distributed support groups who provide KnowledgeBase information will be able to offload questions to the Web, the call center, and the helpdesk, thus decreasing their operating costs and time spent on easily-resolved calls. There are currently over 1,300 knowledge articles in the public KnowledgeBase. The private KnowledgeBase, which houses primarily confidential information, contains over 200 articles.
VTnet:

VTnet is a suite of software applications that is provided to affiliates at the beginning of each year. This suite provides network connectivity wizards, anti-virus software, e-mail programs, operating system updates, and other general network applications and utilities.

VTnet is successful because it enables the majority of students to configure their computers and connect them to the network without having to call for support. VTnet CD’s are placed in every dormitory room and are also available at multiple software distribution points across campus.

The cost of producing this software package is relatively high. Project leadership begins in January and continues until the programming and supporting documentation are complete and the CD is sent for duplication, normally in early to mid-July. Although six to seven months development time might seem large, much preparation goes into the selection of software that is included on the CD and the negotiation of contracts and licensing agreements for the distributed software. In the end, Virginia Tech produces 11,000 CDs at a cost of approximately $0.80/CD (not including staff time).

Aside from network configuration by the incoming students, the VTnet CD provides many other benefits. In the past several years, viruses have been a large problem at Virginia Tech. The VTnet CD scans a computer to see if anti-virus software is already installed. If no anti-virus software is present, the owner is asked if she/he would like it to be installed.

Academic departments sometimes request to put specific products or browser plug-ins on the CD. Putting their software on the CD helps the departments distribute software to their students and gets the students properly configured for the classes they will be taking. This, in turn, helps the professors by reducing the amount of time they must spend instructing students to get and install specific programs.

Finally, the CD also contains operating systems updates and utilities that assist the helpdesk and other support staff. Because Ethernet, modem, and other configuration tools are on the CD, customers needing assistance are not forced to download tools and the support staff is able to spend less time on a call. We have found that the VTnet CD has reduced the number of calls to the call center, helpdesk, and partnering support groups and has lessened the time spent on certain calls.

Targeted Onsite Student Support:

Students are the largest supported group of users at Virginia Tech, providing 65% of the support requests we receive. Because of this, we have created several targeted student support groups. Two of the most prevalent and successful are the Get Connected program and the Resident Computer Consultant (RCC) program.

First begun in 1998 and lasting the first 2 ½ weeks of the fall semester, Get Connected is a program designed to get the computers of students living in residence halls set up, configured, and connected to the network. Get Connected staff is made up of 90 students divided into 13 teams. For the first four days of residence hall move-in, the Get Connected staff canvasses the residence halls, working 12 hour days. After the first 2 weeks of classes, hours drop off to 5-9 p.m. only. During the first 2 ½ weeks, the Get Connected staff don’t make one-on-one appointments. Rather, they visit areas on a
published schedule. This enables the Get Connected teams to help large groups of people in a specific physical location and get people connected and configured more quickly. For the remainder of the Get Connected program, one-on-one appointments are necessary because both the Get Connected team members and the supported students must work around class schedules. This allows students still experiencing problems to get assistance at a convenient time.

In addition to providing simple network connections and configurations, the Get Connected staff is trained to provide computing support for a wide variety of problems experienced by the incoming students. These problems can be as simple as replacing a bad network cable to as difficult as replacing a bad NIC or diagnosing other hardware or software problems.

The Get Connected staff also provides anti-virus installations to help make sure that as many people as possible are using anti-virus software. Because virus problems have consistently been the number one problem dealt with by the helpdesk consultants, installed anti-virus software has likely helped cut down the number of calls we receive.

The Get Connected program has been highly successful, but not without a high degree of planning and lesson learning. Although many of the lessons may seem obvious, they clearly reveal that any oversight in planning can lead to problems. Because the staff members are students and the job is short in duration, wages must be higher to attract quality employees. We have also learned that requiring the employees to wear Get Connected t-shirts and name tags not only increases their visibility to the public, but also lends credence to the support they are providing because they are recognizable as university provided computer support staff.

It is necessary to provide the teams with the highest quality equipment possible. This includes laptop computers for testing connectivity of Ethernet portals, spare NICs to swap with problem NICs, 2-way radios for good communication between team members and team leaders, plenty of spare Ethernet cables, and spare OS/driver CDs. By providing redundant equipment, the Get Connected staff is able to provide immediate support with no return visit required.

Perhaps the largest problem has been providing Get Connected support to special communities on campus. These communities include the fraternity and sorority organizations on campus and the Corps of Cadets. These groups live in special purpose housing and are kept constantly busy during the first few weeks of classes. Their busy times often extend deep into the night, which makes it difficult to organize times for Get Connected staff to make a visit. Patience has thus far been the best solution to working with such tight and varied schedules, although we hope that future early planning may help these groups set aside specific times for Get Connected visits.

The cost of the program is high. We spend upwards of $65,000 on wages. However, the customer satisfaction and the public relations value generated by this program have made it a high profile success in the eyes of the administration, the parents, and the faculty. Parents and their children see dedication by the university to supporting the expensive computers they are required to purchase. Parents and their children come to understand that, although Virginia Tech is a large university, each student is still an individual in the eyes of the university administration. Get Connected helps faculty avoid having to provide computer support in the classroom. Because most students have network access from the first day of classes, faculty members are able to direct their
students to online syllabi, assignments, and other course-related information. And, the students who get quickly and painlessly connected win because they have immediate access to campus network resources, including e-mail.

The Resident Computer Consultant (RCC) program started in 1999 as a way to provide year-round onsite desktop support for students living in the residence halls. Initially it was a pilot program serving only 3,100 of the residence hall students. It has since moved from pilot to full program and now provides support for all 8,900 students living in the residence halls. The staff consists of 18 students who are paid $77/week for the support they provide. RCC hours are 6 p.m.-11 p.m., Sunday-Thursday, with each RCC being responsible for 10 hours/week. During their scheduled shift, an RCC may or may not provide support for students, depending upon whether support has been requested; however, they are required to remain available during their scheduled hours.

Two methods exist for requesting RCC support. The first, and simplest, is when a dorm resident phones or goes to the RCC and requests support. When this happens, the RCC generate a problem ticket and schedules an appointment with the student. The second is when a helpdesk consultant determines that the question he/she is working on could better be addressed by a RCC. When this happens, the student is told that a RCC will call her/him, and the ticket is then transferred to the RCC group. RCCs promise to contact students in their problem ticket queue within one business day.

Although successful, the program has experienced its share of impediments. To date, there have been relatively few requests for RCC help. Both the residence hall students and the helpdesk must continue to learn how to best leverage this onsite support group to its fullest value. The RCCs also have commented that they don’t feel as if they are part of a team. Because they live in the dorms and the helpdesk is situated away from campus, they don’t feel the presence or interest of helpdesk staff. In order to combat these feelings of isolation, we have begun holding large training sessions, inviting not only the helpdesk staff, but also the KnowledgeBase editing team and the RCCs.

In spite of the small number of calls, RCCs have been an invaluable aid to the helpdesk as well as the students they serve. Many support requests that in the past would have been referred to a vendor are now routinely sent to the RCC group. Because they have OS and driver CDs, they can provide direct support for a wide range of problems. The RCCs are also able to provide further troubleshooting for some hardware problems that the helpdesk would at one time have directly referred to a manufacturer.

The RCC program has demonstrated that partnering between departments can produce opportunities for accomplishment. The Residence Halls provide space for the RCC staff but don’t have to pay the salaries. 4Help pays the salaries of the RCC employees, but gains the value of being able to deploy an onsite support group. Both departments gain value and the students living in the residence halls gain an alternative to phone-based support.

**What We Have Learned:**

Computer support at Virginia Tech has come a long way since 1969. No longer are we attempting to support a single customer group using a defined list of computer applications in a mainframe/dumb terminal environment. No longer are we simply providing user manuals for applications. Virginia Tech, like most support organizations, has been forced to redefine its strategies for supporting a client-server model being
accessed by people from all over the world. In addition to faculty, staff, and graduate student research computing, the university must also support a group of undergraduate students whose interests are diverse. Alumni support is growing in importance at the university and every attempt is being made to increase the number of systems that alumni (3,500 alumni have already registered for a Virginia Tech ID) are using at the university, including online course offerings and lifetime e-mail accounts. In order to provide support for a larger, more diverse audience in a distributed computing environment, Virginia Tech’s 4Help has had to be creative, employing tried and true solutions in new and improved ways. 4Help has also been forced to redefine strategies for success. In a fast-paced world where every second counts, 4Help is striving to deliver better service faster and cheaper.

One way 4Help has tried to do this is by leveraging resources to create a 24x7 call center that processes calls for multiple service partners who all use a central problem tracking system. By moving call routing to the call center rather than leaving it with the individual support groups, customers are assured of faster return calls by the group with whom they need to speak.

4Help has also strived to move services such as password resets to the front of the support model. By providing the call center with a way to reset passwords, customers can be back on the network and checking their e-mail in very little time, 24x7.

The KnowledgeBase has been a central tool in the arsenal. If most of the common questions asked by university affiliates can be captured and placed online in an easily searched environment, it is only reasonable to expect that more people will begin to find the answer to their question themselves. Initial indicators point to success in this area. In addition, each article in the KnowledgeBase includes a form that customers can fill out to indicate if the article was helpful. People are taking the time to fill out these forms and are providing us with valuable information that can help us provide better online resources. Self-service solutions are provided at an initial expense to the university, but each subsequent use of the knowledge costs nothing. Incrementally, this drives down operating costs and provides customers with quick answers.

Software products such as VTnet, although expensive, provide incalculable benefit to the university. Such products push the use of key products, such as anti-virus software, and provide consulting tools for helpdesk staff. Thus, calls are either eliminated altogether because virus problems are fixed before they happen or the length of calls is shortened because the customer already has the necessary tools on a CD.

Targeted programs for students help get them configured and online quickly and easily. Calls to the helpdesk are reduced and an added onsite support group is made available to the customers and the helpdesk.

Is this brief picture of how Virginia Tech’s 4Help and its service level partners attack computing support problems a blueprint for success for all universities? Probably not. Every institution is unique, having different funding levels, staffing levels, missions, organization sizes, and customers. However, examination of how we have been successful can perhaps indicate ideologies and workflows that can lead to success in any organization. We believe that we have identified sound business processes and created appropriate groups so that we are best able to target the problems our customers are experiencing. By attacking these problems using a variety of technologies and methods, we feel we are able to provide fast and cheap support to all Virginia Tech constituents.
### Table 1: Virginia Tech Specifics

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<tr>
<th>Land-grant university located in southwest Virginia</th>
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<tbody>
<tr>
<td>26,000 students, 8900 living in residence halls</td>
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<tr>
<td>4,000 faculty and staff</td>
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<td>3,500 alumni actively using Virginia Tech provided computer resources</td>
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### Table 2: Helpdesk History

<table>
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<tr>
<th>Year</th>
<th>Event</th>
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<tr>
<td>1969</td>
<td>First helpdesk in operation; provides support for faculty, staff, and graduate students</td>
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<tr>
<td>1974</td>
<td>First mainframe for general users</td>
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<tr>
<td>1984</td>
<td>College of Engineering requires all incoming students to have a computer</td>
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<tr>
<td>1988</td>
<td>Creation of first problem tracking system; Call center begins operations</td>
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<tr>
<td>1989</td>
<td>First KnowledgeBase, internal use only</td>
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<tr>
<td>1991</td>
<td>Helpdesk begins answering questions from undergraduate students</td>
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<tr>
<td>1994</td>
<td>First VTnet network connectivity software developed and distributed</td>
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<tr>
<td>1996</td>
<td>Desktop Support group forms; provides onsite. support to administrative staff working with administrative systems</td>
</tr>
<tr>
<td>1998</td>
<td>Computer requirement for all incoming undergraduate students.</td>
</tr>
<tr>
<td>1999</td>
<td>Peregrine Service Center deployed as next version problem tracking system</td>
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<tr>
<td>2000</td>
<td>Public KnowledgeBase project begins</td>
</tr>
<tr>
<td>2001</td>
<td>Call center begins answering calls 24X7; support for alumni customers begins</td>
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Figure 1 demonstrates 4Help’s customer-driven support model. Customers have multiple mechanisms for getting assistance. They can directly search the online KnowledgeBase, contact the call center for call routing, contact the Helpdesk directly via e-mail or web form, or contact their RCC. As a central underpinning to the success of the operation, the KnowledgeBase serves to provide support to all levels of the organization.
Figure 2 indicates the general cost of problem resolution. Working from left to right, the number of calls answered by each group is represented by the sizing of the pipes. The groups on the far right include partnering departments and technical specialists whose time is costly and who normally interact little with the customers. Again, the KnowledgeBase serves as a primary underpinning to the workflow.