
Chapter 2: Data and Voice Networks

CU-Boulder's data and voice networks are a strategic resource for faculty, students, and staff, providing the virtual backbone for all campus communication. Maintaining and expanding these resources appropriately is an ongoing strategic effort.

The first section of this chapter outlines next steps in developing a new data network funding model that covers the annual costs of the data network and includes sufficient renewal and replacement costs associated with the network. The current data network funding model, developed in FY2000, is a pay-per-jack model, which is now outdated, considering the current high and anticipated pervasive use of wireless on campus. The findings from this subsection suggest that a campus-wide committee be formed to study and adopt a new model. The committee should consider various solutions such as a usage/utility model or a "common good" solution to provide sustained funding for the data network.

The second subsection in this chapter discusses next generation telephony and the immediate need to decide what functionality and services a new telephone service should provide. The current telephone system was purchased with a bond that will be fully repaid in 2008, making the next year an opportune time to assess what services are required on campus, and what new infrastructure is needed to deliver and support them.

2.1 Data Network Funding Model

Major Issue: The current data network funding model is inadequate to generate sufficient annual resources to cover annual network costs. In addition, the current pay-per-jack funding model does not recognize wireless connections in the cost recovery calculations. To address these issues, a Network Funding Task Force should be commissioned to investigate and propose a robust and scalable data network funding model that addresses current and future data network funding challenges.

A. Background/Rationale

The data network is an increasingly strategic service that faculty, students and staff rely on to fulfill the mission of the university; achieve coursework; conduct research, and carry out essential business for the continued operations of the university. A network that is reliable, mobile, fast, and state-of-the-art by providing ease-of-use and mobility is expected by all members, and at all levels of the university.

The current data network funding model is structured around a pay-per-jack scenario. It also includes a differential price structure (e.g. alliance fees) that allows certain entities (e.g. Housing, ITS, JILA, LASP, etc.) to obtain access to the network, while maintaining their own departmental networks. Non-alliance fees include access to, and service provided by, ITS. These users include schools, colleges, other general fund units, and auxiliary units. The pay-per-jack model was adopted in FY2000 and functioned reasonably well.

In 2002 the Chancellor invested \$3M in the network remediation project that included a complete replacement of the campus network electronics. This was the first time the campus invested strategic resources in the campus network, recognizing the strategic value of ubiquitous networking for students, faculty and staff. The impact of this project was significant; resulting in markedly higher network performance, reliability and security.

Funding for network improvement, and specifically wireless, originally was approved in the FY2000 program plan from the state capital construction funding, but was retracted in FY2004 due to a state budget crisis. Students, during a historical referendum, voted to help fund the construction costs for several new buildings as well as establish a wireless network throughout the majority of the campus. Because of this one-time infusion of funds, implementation of the wireless network should be completed by December 2006. When completed, the campus will see an increase in wireless service from 29% coverage to 100% coverage of general fund buildings. In addition to this increase in coverage there will be a variety of improvements that will affect both new and existing wireless service. These security enhancements include the implementation of network access controls, authentication improvements and improved roaming in high-density environments.

Now that wireless is a viable network solution for some individuals and departments, a concern exists that those who needed minimal services will unplug their network jacks in favor of wireless, perceiving it as being “free.” If, under the current data network funding model, numerous individuals and departments eliminate their wired

connections for wireless, the revenue stream will quickly erode, jeopardizing the current level of service and reliability; therefore, it becomes clear that in this environment the current pay-per-jack funding model is not viable and an updated funding model must be developed.

B. Accomplishments to date

ITS, the provider and manager of the data network, worked to continuously improve the network by: 1.) securing the network by segregating it into network zones and providing a campus-wide firewall; 2.) increasing the wireless data access points from 400 to approximately 1100 access points (anticipated by the Fall of 2006); and 3.) upgrading data switches on campus to improve reliability, provide greater port-based controls over usage, and power over Ethernet capability.

C. Specific Recommendations

The Vice Provost for Academic and Campus Technology and Senior Vice Chancellor for Budget and Finance should commission a Network Funding Task Force that:

- a. reviews various data network models that peer institutions have successfully adopted;
- b. develops a reasonable data network model for CU-Boulder; and
- c. proposes it to the executive staff during the 2006-2007 school year.
- d. the updated network model is implemented during the 2007-2008 school year.

The model should:

- e. cover the complete cost of the data network (The complete cost will be clearly identified and documented by the task force.)
- f. be based on criteria that is reasonable and clear
- g. include adequate security
- h. offer a basic suite of data networking services for all university members (The basic suite of services will be determined by the task force.)
- i. include appropriate renewal and replacement costs

D. Resource Allocation

Cost of project: The cost of investigating peer institutions' funding models and developing a new model will be absorbed by existing staff time. The cost of implementing a model (e.g. changes or updates to a new billing system) is undetermined at this time. Ideally the updated model will impose a fee structure that does not materially affect negatively the budgets of current department network customers; therefore the impact will be minimal.

E. Action Plan

Short Term: Commission the Network Task Force to complete the study and forward recommendation.

Long Term: Adopt a sustainable and scalable data network funding model that provides an adequate and secure level of annual resources to cover annual network operating costs, maintenance costs, and plans for future growth and enhancements in order to

continue to raise the status of CU-Boulder as a top public research, teaching and learning institution.

Specific Steps and Timeline

1. Commission the Network Task Force – Summer 2006
2. Review peer models, collectively understand the current funding and anticipated shortfall – Summer 2006
3. Develop the updated model, test and revise – Summer 2006
4. Communicate to the affected parties, revise – Summer 2006
5. Propose model to the executive staff – Fall 2006
6. Executive staff adopts a model and communication to the vice chancellors, deans and other high-level administrators occur – Winter 2006
7. Campus-wide communication regarding the new model occurs prior to fiscal planning – Spring 2007
8. New model fully implemented – July 2007

Primary Person(s) Responsible

Bobby Schnabel, Vice Provost for Academic and Campus Technology, and Ric Porreca, Sr. Vice Chancellor and Chief Financial Officer.

Evaluation of Achievement

Data networking is an expensive investment; however, so essential to the universities day-to-day operation that it must be viewed as a strategic resource. Steps need to be made to ensure that the network is meeting the needs of faculty, students and staff. This translates into real costs that squeeze already-tight budgets. It will be important to evaluate the new model to determine the level of satisfaction the university community has regarding the network versus the trade-off of using those dollars for other equally critical budget item.

It is recommended that a review of the data network model be performed by Planning Budget and Analysis within one year of adopting the data network model to determine if the level of funding appropriately matches the service, security, and renewal/replacement needs determined by the campus and/or if additional modifications are necessary.

2.2 Next Generation Telephony

Major issue: Over the past ten years, the campus, and indeed the world, has seen a dramatic shift in the how people use the telephone, and expectations of customers are evolving toward more mobile and enhanced services. The most major change is growing interest and dependence upon mobile telephony services. Related expectations include anytime and anywhere services, customized preferences, and enhanced services such as paging and text messaging. Over the next four years the campus needs to addresses these telephony services challenge while leveraging the solid telephony infrastructure and support services currently in place.

A. Background/Rationale

For the past 20 years the campus has utilized a solid telephony system that was designed to meet campus office requirements as well as residential requirements. The fixed-line system was deployed with basic telephone features and voice mail. In addition, the system supports call centers all over campus to meet the needs of high volume telephone applications. Today, many campus customers have business cellular phones to handle their mobile communication requirements. Students in particular rely upon cellular phones as their primary communication device. The features and mobility of cellular service are important to recognize as essential requirements of any next generation telephony solution.

Thus, ITS should be commissioned to develop telephony services that incorporate the features that customers desire, are flexible so that as new features and capabilities are developed by the industry, they can be quickly offered to our customers, and which will accommodate the strong demand for the convenience of wireless phones. This must be done in conjunction with the significant fixed-line telephony capabilities that will be required to support the business of the campus for many years to come.

The current telephone system was purchased with a bond that will be fully repaid in June, 2008. This is an opportune time to commission an analysis effort to assess what services are required on campus and what new infrastructure and skills may be required to deliver and support these services. The telephony funding model has been developed as a full recharge service center, and, any future solution should consider various funding options.

B. Accomplishments to date

As mentioned in the 2002 Strategic Plan, telephone services have held largely steady over the last 20 years. The current cost of fixed-line services compare favorably with comparable services such as Qwest's enterprise class services. There have been minor services changes over the years, such as Caller ID and E911 services. The core processors for the telephone system have been upgraded so that the system is easier to maintain, and the cost of PBX maintenance has been reduced by "in-housing" portions of the maintenance activities. The system upgrade included the capability to support Voice over the Internet Protocol (VoIP) telephones with that new system hardware. ITS has also done a very limited pilot of VoIP equipment from CISCO; the limited scope of the pilot provided exposure to the technology but was not sufficient to analyze the solution in the context of a campus the size of CU-Boulder.

C. Specific recommendations

The campus should engage in a comprehensive requirements analysis in 2007 to understand campus telephony needs, appreciating both the fixed and mobile requirements. The analysis should address departmental requirements as well as students living in the resident halls and family housing.

The analysis should also address the possibility and capability of integrating traditional telephony systems with data networks, the broad array of messaging systems, video services and application services. The potential of efficiently integrating these services is real and represents effective enhancements to support the mission of the campus. The appendix at the end of this chapter represents many areas that should be examined as part of this analysis.

D. Resource Allocation

Funding for some of these developments is already included in the existing Telecommunication Auxiliary budget.

E. Action Plan

Short term: (12 months)

- Begin requirements analysis for next generation telephony. It is anticipated this process will take 12-18 months.

Long Term: (36-48 months)

- Specific Steps: Establish an implementation project for the next generation telephony system including all integrated services
- Timeline: The system conversion should conclude no later than 2010.
- Primary Person Responsible for Action: This should start in the Architecture group of ITS.

Appendix A: Topics for further study

Integrated messaging

- Blending of voice mail with e-mail, both accessible from customer's computer or telephone.
- Elimination of the need for FAX machines.

Mobility

- Within an office or building:
 - Bluetooth headsets
 - Cordless phones
 - 802.11 Voice over wireless LAN
- Across campus and beyond:
 - Cellular service - Partner with one or more service providers

Telecommuting support

- Allow the appearance of office telephone numbers at home or on the road.

Reduce service prices, possibly including:

- Free long distance
- Bundled services, similar to many service providers

Richer set of telephone features

- Call history
- Directory access via the telephone
- Web access via the telephone
- User control of telephone configuration
- Color display
- Customizable display, either from the customer's department or from ITS

Develop new revenue producing services, yet competitively priced.

- Advertising or important information on the telephone display
- Could market space on phone to housing or athletics for example.

Philosophical change in providing more services and options to the customer.

Video conferencing

- Some phones can have cameras, just like many cellular phones.
- Customer's computer is also a likely end-point for a video conference.
- More video phones and video conferencing appliances are available.

Life/Safety issues

- There is an expectation that a telephone will always have service available, even when the power is out, and particularly when calling 911.
- There is also the expectation that the customer's location will be automatically provided to the Public Safety Answering Point. It is imperative that the next generation telephony system should support both E911 and reverse 911
- There is also a less widely held expectation that the telephone system can be used to call large numbers of geographically selected customers to deliver a recording pertinent to some emergency (aka, Reverse 911).