State of the Network

The current state of the network was based upon three criteria: closet electronics (hubs, switches, routers), infrastructure (closets, conduits, fiber, coax) and wiring (copper, coax). Using these criteria and the associated published standards for each, an assessment was made of each building on the Storrs, Depot and Regional campuses.

After all of the buildings were researched only 25% of the buildings have electronics equipment installed based upon today's standards. Only 33% have rooms that would be acceptable based upon the currently published standards. Only 14.5% have wiring that would be acceptable based upon the current standards. After all of the buildings were researched only 8% are fully compliant based upon the standards, while 92% need some type of upgrades. While virtually all parts of the University, including the regional campuses, have connectivity to the network there is a lot of work to be done to bring every building up to a base standard.

Attachments A1 & A2: are graphical representations of the currently installed closet electronics. ***A1*** represents the status of the Storrs campus and ***A2*** represents the status of the Depot and Regional campuses. Buildings colored green represent compliant closet electronics. Buildings colored red represent non-compliant closet electronics.

Attachments B1 & B2: are graphical representations showing which buildings have closets that meet today's published standards. ***B1*** represents the status of the Storrs campus and ***B2*** represents the Depot and Regional campuses. Buildings colored green represent compliant closets. Buildings colored red represent non-compliant closets.

Attachments C1 & C2: are graphical representations showing the wiring condition of the buildings. ***C1*** represents the status of the Storrs campus and ***C2*** represents the Depot and Regional campuses. Buildings colored green represent compliant wiring. Buildings colored red or yellow represent non-compliant wiring.

Attachment D1 & D2: graphically represents all three criteria together and shows which buildings are fully compliant based upon the published standards. ***D1*** represents the status of the Storrs campus and ***D2*** represents the Depot and Regional campuses. Buildings colored green represent fully compliant buildings. Buildings colored red represent some form of non-compliance.

University Community's Projected Needs

Based upon input from users in the community, standard networking features should include such things as video in the classroom, differing levels of service based upon need, mobile computing and distance learning. Implementing all of these features will require the entire network to be brought up to base line standards to allow for end-to-end delivery

and management. This will also help in improving equality between the Storrs and Regional campuses.

All of these improvements can result in better services for the University community and allow the *technology* of communications to become transparent. As a result, the communication is the information that is exchanged, not the process of establishing the communication itself. Just as users don't consider what is happening within the Telephone Switch when they dial the ten-digit number on their telephone today, rich multi-faceted communication on the University Network should not require any more than knowing the identity of the recipient of the communication.

Advanced features and increased speeds will allow users of the University Network to communicate and collaborate without complicated technology hampering the communications. Security in the applications and network devices on the University Network should allow confidential and accountable transactions to occur. The University Network should be managed to allow the necessary resources required to be available where and when needed on the campus.

Some of the advance feature sets include but are not limited to, VLAN(Virtual LAN's) support, QoS(Quality of Service) support, Multicast support, Streaming video, VPN/Firewall(Virtual Private Network), wireless capable, VOIP(Voice Over Internet Protocol) capable, I1(Internet 1) and I2(Internet 2) access.

Planning Factors

In order to support these feature sets, the network design must accommodate the increasing demands placed upon it. No longer should the sole key to improving network performance be adding more bandwidth. To support real time voice and video applications, the University Network will require high redundancy, minimal interruptions, little to no delay of the information (latency), and the ability to prioritize traffic. A full-featured network will need to dramatically improve its fault tolerance, resilience and recovery time to fully meet the expectations of the University community.

Today the primary role of network management is to keep the network up and running and to provide an acceptable level of network performance to all customers. Tomorrow different customers and applications may have very different network resource requirements, particularly in a full-featured network. Over the years, the network has operated on a best effort basis with all customers having access to the same service level, and with some over provisioning built in to provide room for growth in network utilization. This model will prove to be unsuitable in the future. It is likely that active management and allocation of network resources will be necessary. In the future UITS must be able to manage differentiated service levels, and control access to those service levels dynamically throughout the Network.

Meeting these goals requires a secure, robust network infrastructure capable of supporting both user traffic and management traffic and maintaining the privacy and integrity of management information. It will also require performance management, accounting management, and configuration management software systems.

Plans to Meet Future Needs for Both Individual User, Department and Building

Another key aspect of the infrastructure is to ensure that it will support converged (voice, data, video traffic) services and the use of a common cable from the communications room to the work area outlet (WAO) in the room or office. The current industry standard is Cat6 data grade cable.

Our design calls for all buildings on the Storrs, Depot and Regional campuses to be provided with electrical power outlets tied to an emergency generator in all Building Distribution Facilities (BDF's) and other communications rooms.

It is also our intent and to provide both commercial and emergency power to the environmental systems in core distribution areas. One of our requirements for future network design is to evaluate sites in existing or new buildings that have adequate electrical capacity on their emergency generator in order to support the power demands. Should this not be possible the appropriate wiring must be in place to provide power from a portable generator.

Physical security of the network is critical to the reliability of the network. In order to provide a physically secure network, all communications rooms across campus should be secured with a unique lock accessible to UITS and appropriate emergency personnel only. This also makes the assumption that no room will be shared with any other department for multiple functions.

Interrelationships of the University Wide Network with Departmental Networks

Wherever possible, UITS Network Engineering should be responsible for network installation, design and management. UITS should set the standards for the physical and logical design with input from the user community. This design should also drive the standards for equipment selection and building design.

Where there are special needs, departments should be allowed to maintain and manage their own networks consistent with University standards. However, Service Level Agreements (SLA's) need to be established spelling out what can and cannot be done on that network. This will ensure that features are transportable across the entire network.

Implementation Strategies

The recommended Network Master Plan calls for a phased approach to the upgrade. The entire upgrade will occur over a three-year period. The first year will be a planning year and a time where the electronics in the distribution layer and academic core get upgraded. This will allow the above mentioned feature sets and baseline standards (***Attachment I)*** to be implemented early on in the plan.

Approximately $2,000,000.00 should be allocated during this first year of planning and initial implementation. By upgrading the Academic core many of the advanced feature sets become available in academic buildings. This allows early technology adopters a chance to exploit these new and advanced features and makes network access equitable to all faculty/researchers in the Storrs central academic area.

Attachment F: shows that the total cost for the project is estimated at $42,000,000.00 for all campuses.

Attachment G: is the detail that went into calculating the needs and estimated costs. In pricing the electronics portion actual retail prices were used. Retail pricing was used, as we do not know at this time when the plan will be approved and phased in. In actuality, equipment pricing may change and discounts will be available.

The next set of priorities will come out of the planning effort from above. Working with A&E services and some outside planning consultants we need to map the wiring and infrastructure efforts with the campus Master Plan. However, we believe that an aggressive scheduled could be followed to complete this part of the plan in two years.

Attachment H: shows a proposed schedule to be followed.

Annual Maintenance Program

On a yearly basis the entire outside plant should be examined. This process should include inspections and cleaning of manholes and handholds. Also all splice cases should be examined every year to ensure no moisture is getting in which could cause corrosion of the cable pairs.

The cost for performing the maintenance is not expected to exceed $500,000.00 per year.

Annual Replacement

Once the installation is complete we would begin to look at the core and distribution layers as these will now be in the fourth year of their lifecycle. Industry standards put

equipment life at 3 years, our current network has much equipment reaching a 10 year active lifecycle. We feel a compromise at 4 to 5 years for equipment replacement would be reasonable.

The cost of the annual revolving replacement of network components should not exceed $1,500,000.00 million dollars per year. This cost could vary somewhat in future years depending on how many new connections get added to the network.

Summary of Risk:

The risk of not upgrading and maintaining the University network will result in UConn being left behind in technology advances. The University must assemble a strong infrastructure of communication related facilities and services throughout the campuses, tailored to meet the needs of our faculty/researchers. If it does not, the result will be vast inequities between faculty and researchers at UConn, compared to their peers in other institutions.

The University should be committed to advancing a communication rich learning infrastructure that benefits students and faculty across all Schools and fields of inquiry. UITS in collaboration with members of the community must anticipate advances in the technology arena and be ready to support them when needed. If we leave things unchecked, “the technology will run us over”.