APPENDIX T

North Carolina Agricultural and Technical State University
Greensboro, North Carolina
Dr. James Renick, Chancellor

Request for
IT Management Flexibility
March 2003

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Executive Summary

North Carolina Agricultural and Technical State University requests authorization to exercise management flexibility in the planning, acquisition, implementation and delivery of information technology under G.S. 116.30.1.

- The document describes the North Carolina Agricultural and Technical State University ITT[1] strategic plan and its relationship to the strategic plans of the campus, UNC IT and the Board of Governors. The major elements of the campus ITT plan are expressed as seven thematic goals: (1) collaborative governance, (2) consolidated infrastructure, (3) integrated content repository, (4) strategic partnerships, (5) diversified funding, (6) timely and responsive training and service, and (7) continuous assessment, evaluation, recognition and reward. These seven thematic goals synergistically define the "*ITT e-Education Framework*."

- The document describes the recent restructuring of the campus ITT organization to form the Division of Information Technology and Telecommunications, the four re-structured committees, and the decision making process. The campus wide consolidation of technical resources including research labs, the establishment of the Student Technical Services organization, and the creation of the CIO (Chief Information Officer) Council are distinctive aspects of the ITT organization.

- The document describes the ITT infrastructure, standards and policies and references their URL locations where more detailed information is available. An important part of the ITT strategic plan is to evaluate and revise the standards, policies, and processes to insure alignment with the major transformation taking place on campus and the opportunities afforded by the continuing developments in leading-edge technology.

- The document describes the management processes with particular emphasis on audit performance, acquisition, project implementation, disaster recovery, business continuity, and professional development and training. Campus wide ITT professional development is the cornerstone of the ITT strategic plan which is implemented through the Academy for Teaching and Learning (ATL), the Center for Distance Learning (CDL), and the Teaching and Learning Systems (TLS) departments.

- The document describes the assessment, and accountability practices of the Division of ITT. The ATL coordinates assessment and accountability activities for the Division.

- The document describes the various funding sources, how those funds are being used, and a plan to diversify funding in order to become more efficient and self sustaining to reduce the dependency on state resources.

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[1] IT is Information Technology and ITT is Information Technology and Telecommunications. The ITT Plan at North Carolina A&T State University encompasses information technology and telecommunications.

The conclusion of this document is that the justification has been presented for thoughtful planning and sustained performance to demonstrate effective IT management at the University. Therefore, North Carolina Agricultural and Technical State University respectfully requests the Board of Governors authorization to exercise IT management flexibility.

**North Carolina Agricultural & Technical State University
Information Technology and Telecommunications
Management Flexibility Request**

Table of Contents

Introduction

An overview of the North Carolina Agricultural and Technical State University campus ITT plan, the *e-Education Framework*, is described in this section. The complete plan is available at: http://www.ncat.edu/cit/strategy/plan.pdf. The overview is followed by explanations of how the *e-Education Framework* supports the campus, UNC, and Board of Governors plans.

Campus ITT Strategic Plan

North Carolina Agricultural and Technical State University's Information Technology and Telecommunication *e-Education Framework* is derived from the "UNC Board of Governors Strategic Directions," the "UNC IT Strategy", and the NC A&T State University "Blueprint for the Future." A governance process was utilized engaging established committees and ad hoc focus groups throughout the University's learner-centered community.

The role of ITT at NC A&T SU is to bring the right technology to achieve the vision of the University. According to Collins (2001):

> "Good-to-great companies think differently about the role of technology. They never use technology as the primary means of igniting a transformation. Yet, paradoxically, they are pioneers in the application of carefully selected technologies." (pp. 13-14).

The *e-Education Framework* is a strategic plan that describes the implementation of key consolidation technologies (converged networks, grid computing, autonomic computing, pervasive computing, and storage area networks) that support and accelerate the NC A&T SU Interdisciplinary University transformation. The plan is formatted into seven levels of detail: (1) mission, (2) vision and values, (3) themes, (4) goals, (5) initiatives, (6) projects and (7) task plans. This format lends itself to assessment and evaluation at various management levels at the University. The mission, vision and values, themes, and goals are the focus of the Vice Chancellor for ITT/CIO and the University Cabinet. The unit managers focus on initiatives. The directors focus on projects, and manage various interdisciplinary teams responsible for detailed task plans. The structure also provides key input to performance planning and evaluation processes throughout the Division of ITT.

The ITT Vision of the *e-Education Framework* is to become a catalyst for change in the transformation and continuing evolution of the Interdisciplinary University stated in "Uncompromising Excellence: A Blueprint for the Future (2003):

> "North Carolina Agricultural and Technical State University is a learner-centered community that develops and preserves intellectual capital through interdisciplinary learning, discovery, engagement, and operational excellence."
> (p. i)

The focus of the *e-Education Framework* on the learner-centered community emphasizes the learner as the primary client and the importance of having a learning organization that is responsive and proactive in an environment of accelerating change. The interdisciplinary focus highlights the need for strong collaborations throughout the learner-centered community. ITT is engaged in a collaborative effort with the School of Nursing, IBM and Vital Source, Inc., to pilot the use of electronic textbooks for junior students. The goals of the two year pilot are: (1) to enhance the learning process and, (2) to reduce the cost of textbooks. The success of the pilot may lead to the establishment of an interdisciplinary environment where all textbooks in all disciplines are centrally located and accessible to all students, all the time. This textbook repository coupled with powerful search engine capabilities of the Vital Source software, will significantly enhance the students' abilities to participate in interdisciplinary learning, discovery and engagement.

The implementation of the *e-Education Framework* is described in seven themes: (1) collaborative governance, (2) consolidated infrastructure, (3) integrated content repositories, (4) strategic partnerships, (5) diversified funding sources, (6) timely and responsive training and service, and (7) continuous assessment.

Collaborative Governance is defined as the staff, committees, and the associated policies, processes, standards, and procedures that regulate the efficient use of technology resources. The governance principles are centered on the theme of creating learning organizations defined by Peter Senge's (1994) research, Jim Collin's (2001) research findings on organizations that transform from good to great, and Lou Gerstner's (2002) views on how the IBM Corporation was transformed.

A distinctive part of the governance structure is the role of students. ITT is establishing the Student Technical Services (STS) organization utilizing the University of Wisconsin model for developing a pseudo-company to provide technology and media services throughout the campus. Students from every discipline have the opportunity to gain valuable experience by leading and managing all aspects of the business including hiring, training, scheduling, evaluating, and performing technology and media service to the campus learner-centered community.

The **Consolidated Infrastructure** theme focuses on creating a state-of-the-art computing infrastructure that will utilize technology resources more efficiently and provide significant added value. Every project is evaluated on implementation cost, operating cost savings, value added, and revenue generating opportunities. The Consolidated Infrastructure consists of five architectural components: (1) networking, (2) computers, (3) storage, (4) access devices, and (5) middleware. These components are described in the infrastructure section of this report.

The **Integrated Repository Content and Accessibility** theme focuses on the content and use of data and information whereas the Consolidated Infrastructure theme focuses on the presentation and delivery structure of data and information. Content repository addresses

the data, information and intellectual property that uniquely define the University and its collective strength and character. The goal of the content repository theme is to define the University's mission-critical information, provide tools, and methods for appropriate access and analysis. The requirements for the content repository will be organized by the key business units of the University: (1) The Office of the Chancellor, (2) The Division of Academic Affairs, (3) The Division of Business and Finance, (3) The Division of Development and University Relations, (4) The Division of Information Technology and Telecommunications, (5) The Office of Legal Affairs, (7) The Division of Research, and (8) The Division of Student Affairs.

The Strategic Partnership theme promotes collaboration and economic advantage. Prior to establishing the strategic partnership plan, ITT used over 50 suppliers and service providers, each having a different blend of hardware, software, methodology, and process. This kind of confusion will be significantly reduced as the directions move toward a small set of strategic partners who can provide comprehensive solutions and leveraged pricing based on the volume of business.

The Diversified Resources theme addresses the financial challenges that CIOs in most higher education organizations are facing. The demand for services is accelerating with the need for faster implementation of solutions while budgets are shrinking. The goals of diversifying resources are to reduce operating costs, identify alternative funding sources, and explore revenue generating opportunities.

The Timely and Responsive Training and Service theme focuses on the need to have a strategy for continuous professional development activities for every University employee and to provide client focused service. The need for constant professional development activities related to using technology and telecommunications is essential for a vibrant learning organization. Equipping every employee with the knowledge and skills to use technology will strengthen the collaborative efforts of the learner-centered community and slow the pace of the alarmingly accelerating need for staff support.

The Continuous Assessment theme emphasizes measurement, assessment, and evaluation to monitor the execution of the strategic plan. Assessments will occur at least three times each year; (1) fall semester, (2) spring semester, and (3) summer session. The essential metrics for the review include: (1) Client Performance (level of service, professional development, and overall client satisfaction), (2) Financial Performance (project expenses, operating costs, potential for revenue generation, and total cost of ownership), and (3) Added Value (capability, capacity, and content creation).

Collectively these seven themes integrate to form a more responsible, resilient, and robust computing environment identified as the *e-Education Framework* for the learner-centered community. The framework represents the applications of leading-edge technology to the field of education similar to how business and government are creating e-Business and e-Government.

Support of the Campus Strategic Plan

During the 2000-01 academic year, the FUTURES Planning and Resource Council was established to advise the Chancellor in planning the future of the University. The Council, together with campus colleagues, students, and community constituencies are continuing to consider future challenges and opportunities. Chancellor James Renick stated: "We must anticipate to our advantage the major changes, trends, socioeconomic and technological movements, e.g. driving forces that will affect North Carolina Agricultural and Technical State University in the next three to five years. Now is the time to capture the opportunities to build on our rich tradition and current momentum." These efforts have resulted in a strategic plan called Uncompromising Excellence: A Blueprint for the Future (the Blueprint).

The University vision, "North Carolina Agricultural and Technical State University is a learner-centered community that develops and preserves intellectual capital through interdisciplinary learning, discovery, engagement and operational excellence," compels the technology and telecommunications infrastructure to provide significantly enhanced data integration and collaboration tools. These tools must be available in a secure, resilient environment that is conveniently accessible by the learner-centered community. Therefore, the ITT Vision is to use technology to create a technically astute interdisciplinary global learner-centered community – students, faculty, staff and various stakeholders. Therefore, the focus is on the people not the products.

The seven themes of the ITT *e-Education Framework* are derived from the five goals of the campus Blueprint:

Campus Blueprint	e-Education Framework
Goal 1. Establish and ensure an interdisciplinary focus for North Carolina A&T State University that mandates overall high quality, continued competitiveness, and effective involvement of global strategic partners in marketing and delivery of programs and operations.	Theme 1. Governance. Establish an ITT governance structure that support interdisciplinary collaboration and coordination through a unified systems of organizational structure, processes, policies, standards, and procedures. Theme 7. Continuous Assessment theme. Measure, assess, and evaluate the execution and impact of the strategic plan. The assessment system is based on three review target periods each year; fall semester, spring semester and summer. The fundamental metrics revolve around our learner-centered community clients.
Goal 2. Deliver visionary and distinctive interdisciplinary learning, discovery, and engagement that include collaborations and partnerships as part of the learning experience.	Theme 4. Strategic Partnerships. Create strategic partnerships and collaborations to leverage purchases and enhance learning opportunities.

Goal 3. Foster a responsive learning environment that utilizes an efficiently integrated administrative support system for high quality programs, research and collegial interactions, and effectively disseminates consistent information to University stakeholders.	**Theme 2.** Consolidated Infrastructure. Transform the ITT campus infrastructure through consolidation to create a converged Internet Protocol (IP) network, clustered computing server farms, storage area networks, and middleware integration using grids, autonomic computing and portal based web services. **Theme 6.** Training and Service. Provide quality ITT training and service to the learner-center community.
Goal 4. Provide superior, readily available student services and programs that recognize and respond to diverse student needs.	**Theme 3.** Content Repository. Create a content rich repository of integrated data and tools to support a leading edge e-Learning strategy.
Goal 5. Enhance and diversify the University's resource base through effective fundraising, entrepreneurial initiatives, enhanced facilities, and sponsored research programs.	**Theme 5.** Diversified Resources. Diversify funding and reduce dependency on University funding through operating cost efficiency reductions, acquisition of grants and generation of revenue producing opportunities.

Support of the UNC IT Strategy

In 1999 the Board of Governors adopted the University of North Carolina's Information Technology Strategy. This strategy is divided into five focus areas: (1) Teaching and Learning with Technology in the classroom, (2) Distance Learning, (3) Services for Students, (4) Administrative Systems, and (5) Logistical Needs. Elements of the *e-Education Framework* derived from the UNC IT Strategy are:

UNC IT Strategy Focus Areas	*e-Education Framework*
Focus 1. Campus Teaching and Learning with Technology includes the support, equipment, and facilities needed to use learning technologies to enhance the educational process from course planning and content development through the pedagogical process and assessment.	The Academy for Teaching and Learning (ATL) is a department of the Division of ITT that is focused on teaching and learning technology, pedagogies, and assessments. ATL is governed through an operating board of eight faculty members selected by their deans to serve two-year terms with 25% release time to engage in the integration of teaching and learning technologies, pedagogies, and assessments in their respective schools and colleges. Faculty members are responsible for scholarly activities and are supported by a dedicated technical support staff,

	and a multimedia facility located in the Bluford Library. *The e-Education Framework* for the ATL includes the development and implementation of a comprehensive e-Learning strategy for the University.
Focus 2. Distance Education is the educational process in which the majority of the instruction occurs when students and instructors are not in the same place. Instruction may be synchronous or asynchronous and may employ correspondence study, audio, video, or computer technologies.	The Center for Distance Learning (CDL) is department in the Division of ITT. One goal for CDL is to establish a single platform for online and classroom course management. Blackboard is the single platform chosen to support distance learning and technology in the classroom. Concurrently, CDL is developing an e-Learning strategy in collaboration with the ATL and other campus focus groups.
Focus 3. Services for Students encompasses the administrative processes that students experience throughout their educational lifecycle from pre-enrollment through graduation and alumni relations.	The *e-Education Framework* includes the implementation and on going support for Web-based products, including Web for Students, Faculty, Alumni, and Employees, the Perspective Student Portal, and Campus Pipeline. NC A&T SU is participating in the UNC Shared Alliance collaboration to implement additional student requirements identified in the UNC IT Strategic Plan.
Focus 4. Administrative Systems includes the process of system procurement, implementation, operations and maintenance, user support and training, and data sharing for the financial, human resource, student information and alumni/development systems.	The *e-Education Framework* includes the migration to the SCT Banner product to address the immediate Enterprise Resource Planning System (ERP) needs of the University. The strategic direction for support of administrative systems includes standardizing on the Oracle database and implementing portal technology to provide personalized workspace presentation.
Focus 5. Logistical Needs is defined as the infrastructure, support services, process, training and other factors needed to achieve the objectives of the other four focus areas.	The *e-Education Framework* includes the completion of the base line infrastructure defined by the Shared Alliance Board, the installation of the North Carolina Research and Education Network (NCREN) distributed network and the expansion of the network architecture to converge voice, video and data.

The Division of ITT works very closely with the Office of the President and theUNC constituent institutions through a series of collaborative committees including:

> High Performance Computing Center (HPCC) Advisory Board
> North Carolina Research and Education Network (NCREN) Advisory Committee
> North Carolina Supercomputer Center (NCSC) Advisory Committee
> MCNC Board of Directors

UNC Share Alliance Board
Teaching and Learning Technologies (TLT) Collaborative
UNC Cause Meetings
UNC CIO Committee

Support of the Board of Governors Strategic Directions

The UNC Board of Governors Strategic Directions are explained by their report, *The University of North Carolina Board of Governors: Long-Range Plan 2002-2007.* The purpose of this report is to:

Delineate missions, establish major directions and strategies, and set strategic priorities for the University and its constituent institutions.

The University of North Carolina Board of Governors six strategic directions of the long-range plan for 2002-2007 are incorporated into the *e-Education Framework.*
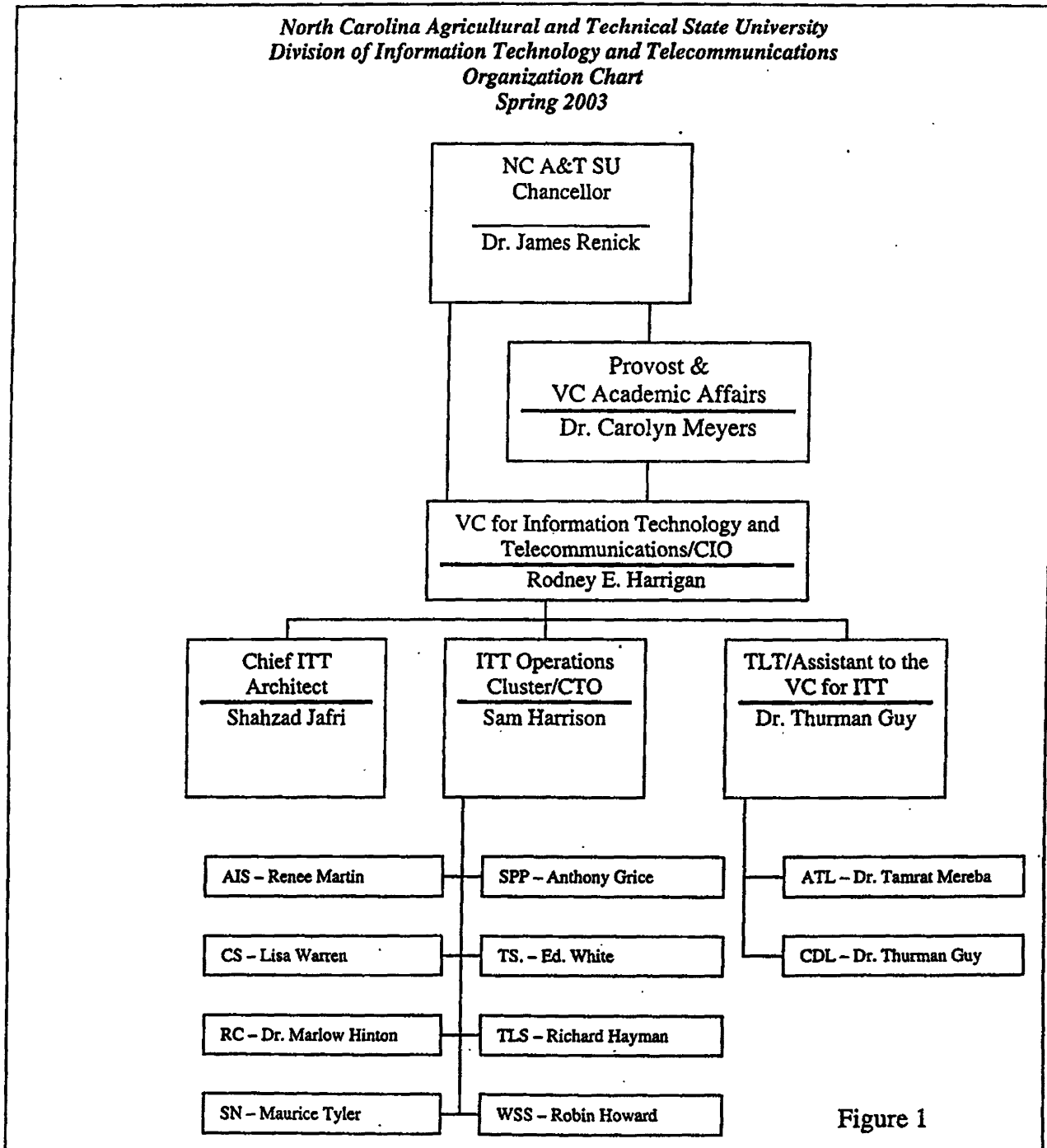
BOG Strategic Directions	e-Education Framework
Access: Ensure access to higher education for all qualified citizens and embrace a vision of life-long learning.	The *e-Education Framework* for ensuring access to higher education for all qualified citizens and embrace a vision of life long learning is to continue to enhance the content and availability of online and extension learning through the Center for Distance Learning (CDL). Degree programs, courses and certifications are being continuously reviewed for inclusion and removal. They will be considerably augmented throughout the five-year period of the plan.
Intellectual Capital Formation: Through excellent graduate, professional, and undergraduate programs, develop an educated citizenry that will enable North Carolina to flourish.	*e-Education Framework* address intellectual capital formation in two important arenas: • The Content Repository theme is to develop the repository of data, information and intellectual property that is used to create intellectual capital. • ITT also plans to add to the education of the citizenry of North Carolina by using online learning to provide instruction for certification in areas such as Cisco, Microsoft, Oracle, and PMI Project Management.
K-16 Education: Continue to propose and support initiatives to serve the needs of the State's public schools.	The *e-Education Framework* for K-16 support includes • Engaging strategic partners to bring national technology programs to families.

	For example, IBM offers a program called Family Technology Day. • Participate in grant opportunities to deliver instruction to public school teachers and students. ITT is collaborating with the College of Arts and Sciences on an National Science Foundation Math and Science Partnership Program (MSPP) grant that focuses on the public school systems. • Provide Cisco certification training through the Cisco Academy. • Work toward utilizing the Regional Point of Presence (RPoP) facility to provide ISP Internet service to outline areas.
Creation and Transfer of Knowledge: Expand the frontiers of knowledge through scholarship and research and stimulate economic development in North Carolina through basic and applied research, technology transfer, and public service activities.	The *e-Education Framework* includes the development of a campus research grid that will increase the collaboration and data sharing capabilities of researchers and increase their ability to attract research funding and share their knowledge.
Internationalization: Promote an international perspective throughout the University community to prepare citizens to become leaders in a multiethnic and global society.	The *e-Education Framework* includes distance learning to support the delivery of online learning. Efforts are underway to establish learner-centered communities in South Africa, Bahamas, and other international countries.
Transformation and Change: Use the power of information technology and more effective educational, administrative, and business practices to enable the University to respond to the competitive global environment of the 21st century.	The *e-Education Framework* addresses transformation and change in two significant ways • As described in the previous section (Support of the UNC IT Strategy), the *e-Education Framework* includes the implementation of the recommendations of the Information Technology Strategy (ITS) project in all five areas: (1) Campus Teaching and Learning, (2) Distance Education, (3) Administrative Systems, (4) Services for Students and (5) Logistical Needs. • A primary governance goals is to develop a learning organization, rooted and grounded in the principles, practices, and process of transformation and change.

Organization

The campus ITT organization was restructured in May 2001, and became the Division of Information Technology and Telecommunications (ITT). The organizational structure and functional responsibilities are described in this section.

Organization Chart

North Carolina Agricultural and Technical State University
Division of Information Technology and Telecommunications
Organization Chart
Spring 2003

NC A&T SU
Chancellor

Dr. James Renick

Provost &
VC Academic Affairs

Dr. Carolyn Meyers

VC for Information Technology and
Telecommunications/CIO

Rodney E. Harrigan

Chief ITT Architect	ITT Operations Cluster/CTO	TLT/Assistant to the VC for ITT
Shahzad Jafri	Sam Harrison	Dr. Thurman Guy

AIS – Renee Martin	SPP – Anthony Grice	ATL – Dr. Tamrat Mereba
CS – Lisa Warren	TS. – Ed. White	CDL – Dr. Thurman Guy
RC – Dr. Marlow Hinton	TLS – Richard Hayman	
SN – Maurice Tyler	WSS – Robin Howard	

Figure 1

T-13

Organizational and Functional Responsibilities

The Division of Information Technology and Telecommunications provides support and service to students, faculty, staff, and administrators throughout the learner-centered community including the alumni, the community, and the University stakeholders. ITT's governing philosophy is to provide operational excellence that promotes a learning community through the application of systems thinking principles and practices. The Division is committed to keeping abreast of new technologies, best practices, and trends which can be appropriately and effectively apply to provide continuously improving support and services to the University community. The Division must ensure the efficient use of technology in the pursuit of the University vision and goals. Efficiency is achieved by building common, integrated architectures, consolidating resources, and reducing complexity, and system multiplicity in favor of gains in efficiency, ease of use, eases of learning, and reduction of the need for support staff. A cornerstone of this philosophy is to provide integrated access to mission critical data while ensuring that the learning community has the skills to achieve the maximum benefit of the information infrastructure. The Division of Information Technology and Telecommunications strongly believes in investing in people and therefore continuously engages in the development of ITT skills and dissemination of ITT knowledge and tools throughout the campus.

An organizational transformation is currently taking place that provides an opportunity for unprecedented operating efficiencies for the campus. In May 2001, Chancellor Renick announced the creation of the Division of Information Technology and Telecommunications and the new cabinet position of Vice Chancellor for Information Technology and Telecommunications/Chief Information Officer. This uncommon action created a level of coordination that will reduce staff redundancies and optimize operations, service and resources. Typically, CIOs manage the administrative operations and instructional computing infrastructure for their respective universities. In many cases the Center for Distance Learning and The Academy for Teaching and Learning functions are not managed by the information technology organization. The Division of ITT has assumed responsibility for all information technology and telecommunications resources including the Center for Distance Learning, the Academy for Teaching and Learning, research IT labs and supporting technicians, TV studios, the radio station and general media services. This increased coordination has already resulted in better planning, faster implementation of technology solutions and increased support for the campus.

The newly created Division of Information Technology and Telecommunications is structured into 14 collaborative operating units: the Office of the Vice Chancellor for ITT/CIO, the Office of the Chief ITT Architect, the Office of ITT Operation/CTO and its eight departments and, the Office of Teaching and Learning Technologies and its Academy for Teaching and Leaning and its Center for Distance Learning.

(1) Office of the Vice Chancellor for ITT/CIO – The Office of the Vice Chancellor for Information Technology and Telecommunications/Chief Information Officer is

responsible for supporting and strengthening the University's learning, discovery, and engagement activities by providing the leadership and management guidance of central services and infrastructure characterized by operational excellence. This office manages the information technology and telecommunications work of the University through three operating units organizing the staff.

(2) Office of the Chief ITT Architecture – The chief ITT architect is responsible for the overall architectural design and coordination of the consolidated ITT infrastructure. This office is responsible coordinating technology design and development plan for all departments in the Division of ITT, throughout the University and with external groups to ensure that the campus infrastructure is developed and implemented using a consistent, comprehensive set of guiding technology principles and standards.

(3) The Office of ITT Operations/CTO – The ITT Operations Unit is responsible for managing eight of the ten ITT departments. These departments plan, install, monitor and support the University's information technology and telecommunications infrastructure. The cluster is led by the Associate Vice Chancellor for ITF/Chief Technology Officer. The eight departments that make up the ITT Operations Groups are each managed by a Director.

(4) The Department of Administrative Information Systems (AIS) – AIS provides software development, project management, and application software technical support for the systems that support administrative processes related to the mission critical functions of the University. The AIS vision is to develop and support a community of knowledge workers (students, teachers, researchers, staff and administrators). They focus on easy access to secure, reliable and timely data, retaining quality staff and partnering with others to provide technical leadership and effective solutions.

(5) The Department of Client Services (CS) – Client Services (CS) provides consulting services and information technology support to University faculty, staff, students, and external stakeholders. The Aggie Help Desk is the centralized point of contact for initiating or receiving status updates and requests. The Client Services Help Desk coordinates the support and services provided by the Web Support Services, Systems and Networking, Research Computing, Administrative Information Systems and all other departments in the Division of Information Technology and Telecommunications.

Students will play a key role in the support and governance of the client services function of the University through the establishment of the Student Technical Services operation is part of the Department of Client Services. Student employment opportunities are open to all students regardless of discipline. NC A&T SU intends to establish the student organization to provide severely needed help desk support through the employment of 100 to 150 students.

(6) The Department of Research Computing (RC) –Research Computing provides support for the University research community to strengthen the use of technology in pursuit of their research goals. The department is physically located in the Research Division to

provide continuous communications. Research Computing is currently engaged in a major effort to create and manage a University research computing grid and to enhance the research administrative technology infrastructure in preparation for the mandatory regulation to submit all proposals electronically. The development of these systems will require upgrading the University infrastructure to support electronic document workflow and electronic signatures.

(7) The Department of Special Projects and Programs (SPP) – SPP provides support for the Division of Business and Finance, Financial Records System (FRS) and other special projects and programs as they arise. FRS is the most critical part of the SCT-centric ERP system and this enterprise function will be the first to be migrated in the University transition to the Banner system.

(8) The Department of Systems and Networking (SN) – SN is responsible for the most technical part of the ITT infrastructure: back office systems, storage and computing systems configurations, maintenance, performance, and general operations. SN is also responsible for the campus network, including the oversight and of the NCREN3 regional point of presence (RPoP) network node. Network responsibilities include coordinating, monitoring, and managing the campus network traffic including allocation of network resources, access to the network, bandwidth availability, and over systems security and performance. SN also manages the functional area staff that supports inventory and point of sale in the Aggie OneCard office and the bookstore.

(9) The Department of Teaching and Learning Systems (TLS) – TLS is responsible for developing information systems to enhance technological proficiency across the campus. The department assists the faculty with integrating technology, pedagogy and assessment into instruction. TLS also assists the learner-centered community by providing workshops and seminars to enhance their productivity and effective utilization of campus technology resource. TLS assists students by helping them become acclimated to the campus computing environment and increasing their awareness of various technology support services.

The mission of Teaching and Learning Systems is to develop, deploy, and manage the infrastructure and curriculum for delivering technology proficiency and professional development competencies to the University community including students, faculty, and staff. TLS also engages in community based initiatives addressing the "digital divide."

(10) The Department of Telecommunications Services (TS) – The Telecommunications Services department is responsible for managing all voice services and voice related applications for the University, faculty, staff, and student populations. The TS mission is to provide effective and efficient voice products and services to NC A&T State University. TS will play a pivotal role in helping the University with the migration from the currently separate voice/video/data network elements to an IP-converged solution. They are also responsible for managing the migration to mobile wireless LAN solutions and maintenance of the comprehensive information technology and telecommunications disaster recovery plan for the University.

(11) The Department of Web Support Services (WSS) – The WSS department was created to provide support for the development, implementation and maintenance of the front-end portal and web interface for the e-Education infrastructure. WSS is responsible for establishing website and portal polices, processes, procedures and standards for assisting the campus learning community with website management and development for publication, communication and collaboration. WSS communicates information on courses of study, faculty and student research, schedule of activities and outreach programs to potential students, researchers, corporate partners and other visitors. WSS also provide support for Internet, Intranet and Extranet design to facilitate such activities as post grades, course schedules, lesson plans, and other documentation critical for students, faculty and staff web-based learning, discover and engage.

(12) The Teaching and Learning Technologies (TLT) Unit – The TLT Unit is responsible for providing guidance, direction, support, instruction and conducting research on the use of technology, pedagogy and assessment to enhance classroom instruction and delivery of online learning. TLT is responsible for the work of the Academy for Teaching and Learning and the Center for Distance Learning. The ATL and CDL are led and managed by Directors.

(13) Academy for Teaching and Learning (ATL) – The Academy for Teaching and Learning (ATL) – The ATL consists of two integrated entities: (1) the ATL Department and (2) the ATL Operating Board. The ATL Department consisting of a support staff responsible for supplying and supporting the tools and techniques necessary for promoting innovative educational delivery systems, and workshops on technology, pedagogy and assessment that will improve teaching practices and support the research objectives of the faculty serving on the ATL Operating Board. ATL is also a place for open forums for the academic community to develop common language and vocabulary for communicating technology, pedagogy, and assessment issues.

The ATL Department is responsible for enhancing the University's overall academic programs by playing a key role in advancing the principles of interdisciplinary learning, discovery, and engagement in the community. The campus radio station and TV studios are managed by ATL. ATL provides a wide variety of services including online course delivery, multimedia services, TV production services, interactive technology services, satellite communications, and teleconferencing services using a varied of protocols.

The ATL Operating Board is comprised of experienced, mostly tenured faculty members who have been carefully selected by their respective deans, from every school and college on the campus, to receive 25% release time for a two year term, to engage in scholar work related to teaching and learning technology and pedagogy. They promote teaching excellence and the scholarship of teaching and learning through the integration of best practices and pedagogical principles with current instructional technology. They also oversee the operations of the ATL Department, provide workshops and research findings to disseminate best practices and share information with faculty and other staff members engaged in professional development, teaching, and learning.

(14) Center for Distance Learning – The Center for Distance Learning offers both non-traditional and traditional students the opportunity to obtain an education through the online and extension modes of learning. Courses offered online are delivered through the Internet. The University offered its first online courses during the Fall 1999 semester. The Center for Distance Learning was established in March 2000 to help promote substantial enhancements in the quality of educational programming available to non-traditional students.

CDL has become an integral part of the curriculum at N.C. A&T State University as students have gained a high degree of comfort with the overall process and procedures for identifying, registering, and taking distance learning courses. The CDL staff identifies "best practices" and common resources for distance learning. CDL also communicates with other universities in the system, and helps the learner-centered community identify and design distance course offerings. In addition, the staff works with service areas within the University to streamline costs and ensure consistent quality service to students at a distance and provide logistics support required for delivering courses at a distance. They are also responsible for negotiating contracts for off campus facility use. CDL staff are encouraged and required to stay abreast of the latest developments in communication for delivery of courses at a distance and participate in appropriate technical associations, seminars, and conferences. CDL is also responsible for establishing the necessary infrastructure to support the online and extension course offerings, including the personnel to maintain the technological linkages for remote access.

CDL has a very close working relationship with the Academy for Teaching and Learning (ATL) and Teaching and Learning Systems (TLS) staff. These three related entities work collaboratively to pursue common goals of pedagogical excellence in all aspects of the delivery of University courses, whether they are onsite or online.

ITT Staffing Classifications – ITT has two broad staffing classifications for the technical support activities: (1) technical support staff and (2) functional consultants. The technical support staff is expected to have expertise in the specific infrastructure technologies such as operating systems, databases, ERP applications and the like, thus become experts in technology products providing horizontal supporting for the client base. The technical staff is expected to become knowledgeable in systems integration in order to effectively support the emerging consolidated infrastructure. There activities are managed by the department Directors and Supervisors.

The functional consultants report to ITT managers but are assigned, as consultants, to various functional departments throughout the University. These functional consultants were formally employed by other departments who were not part of the information technology group formally known as Computer Information Systems (CIS). Functional consultants are responsible for providing technical support for the specific area to which they are assigned and therefore receive their daily supervision from the supervisors of their assigned area. The area supervisor and the ITT manager work cooperatively to evaluate the performance of each functional consultant. The functional consultants are

expected to know how to support the technology used in their assigned area. They are also expected to know and work toward the implementation of the ITT strategic plan and know functional departmental applications and operations. Functional consultants are expected to provide a vertical support focus for the client base by knowing the business and the technology of the departments they support.

Every member of the ITT staff is expected to develop the skill to design and facilitate workshops and seminars for their respective areas of expertise.

ITT and Academic Affairs Collaboration – The strong ties between the Academic Affairs Division and the Division of ITT represented by the collaborative efforts of ITT staff and Academic Affairs faculty through the ATL and CDL departments are further strengthened by the reporting structure. The Vice Chancellor for ITT/CIO reports to the Provost and the Chancellor. This increases the credibility of the ITT staff with the faculty and encourages faculty to engage in the development and use of technology without having to leave Academic Affairs.

Standing ITT Committees

The committee structure for support and guidance of ITT work has been re-constituted as part of the on going effort to align the governance structure with the Interdisciplinary University vision. There are four standing committees, that provide checks and balances for information technology and telecommunications planning and operating activities.

Campus ITT Advisory Committee (ITT Steering Committee) – This committee is responsible for reviewing and recommending University information technology and telecommunications policies, processes, procedures and standards. They also monitor and evaluate the implementation of the campus-wide ITT strategic plan, identify campus-wide information technology and telecommunications needs, and interface with the external advisory committee of ITT strategic partners to collaborate on University ITT directions.

External ITT Advisory Committee (CIO Council) – This is a committee of CIOs from industry, government and education who advise the University on information technology and telecommunications matters. The committee is comprised primarily of strategic partners and supporters who engage in reviewing the *e-Education Framework*, processes, policies, procedures and standards for completeness and consistency and interface with the Campus ITT Advisory Committee. They utilize their experience and contacts to assess and recommend matters of supervision, management, leadership and general governance of ITT campus affairs, as well as providing support and assistance in acquiring alternative funding sources, in-kind services and grant endorsements.

University Content Repository Committee – This committee is responsible for reviewing and monitoring the implementation for the Banner database product and subsequent

enterprise resource planning (ERP) improvements and migrations. They are charged with making recommendations related to management, security, maintenance, protection and survivability of the University database. Additional responsibilities include the review and recommendation of policies, processes, procedures and standards for data access and storage.

University ITT Security Council – The University ITT Security Council is becoming increasingly important to the survivability and resiliency of the University. As technological change continues to accelerate, new vulnerabilities and threats emerge. This committee was established to provide advice and recommendations for the appropriate focus on a cyberspace security strategy. These strategies must be dynamic and continually refreshed to adapt to the changing environment. The council should recommend security related policy, processes, procedures and standards; monitor effectiveness; assess vulnerabilities and associated risks, and provide guidance on campus communications about responsibilities of the learner-centered community. This Council also hears security concerns and recommends solutions to security problems that may arise.

The four committees are encouraged to work collaboratively with the rest of the learner-centered community through focus group discussions and one-on-one meetings with various individuals.

Decision Making Process

Campus ITT decision making is a collaborative process that engages everyone who desires to participate. Faculty, staff and administrators are encouraged to bring suggestions, concerns and ideas to committee members as the need arises. Focus groups and occasional surveys are also conducted to learn about technology needs of the learner-centered community. User groups are established as the need arises for continuous feedback and communications. For example, the AIS Users Group provides valued input on the concerns and needs related to the SCT Plus systems, the backbone of administrative computing. ITT also participated in regular forums called "Community Meetings" that are held each semester and conducted by the Office of the Provost enhance communication with faculty and staff. ITT issues are raised and addressed, resulting in improvements to infrastructure. The information from these various sources are submitted to appropriate ITT departments and committees for follow up: the ITT Steering Committee, the CIO Council, the University Content Repository Committee, and the University ITT Security Council.

Policy, process, procedure, and standards recommendations are reviewed by the Office of the Vice Chancellor for ITT/CIO and submitted to the University Cabinet as appropriate, for approval. The Cabinet engages the Board of Trustees when necessary. If approved, they are incorporated into the University ITT Strategic and Operations Plans. The FUTURES Planning and Resource Council that serves as an advisory body for the Chancellor, provides an additional level of support for the *e-Education Framework*.

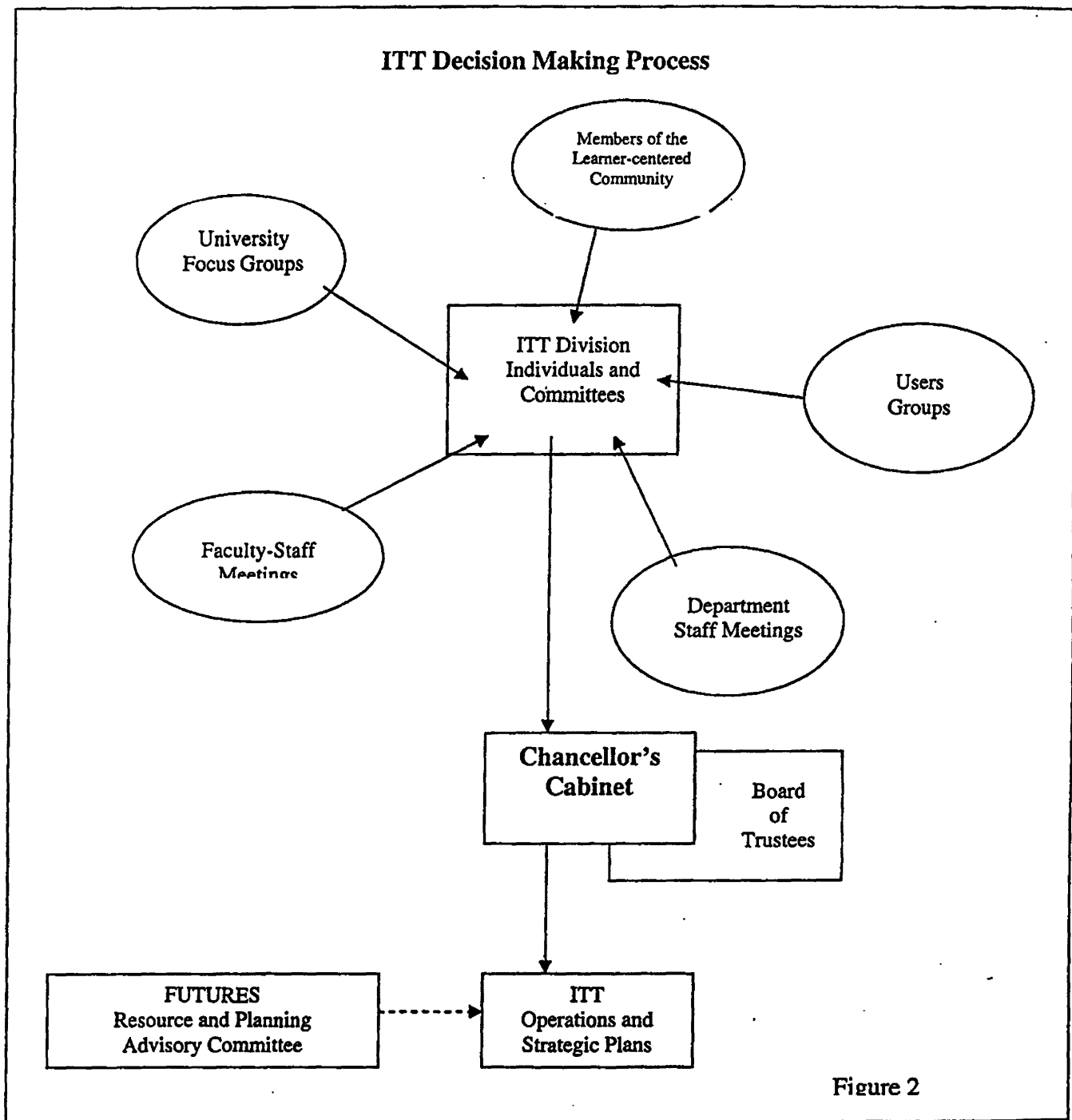The decision-making process is depicted in figure 2.

ITT Decision Making Process

Figure 2

Figure 2 – Decision-Making Process

Campus ITT Infrastructure, Standards, and Policies

The campus infrastructure defined in this section reflects current and planned features of the infrastructure. As the infrastructure is transformed the policies and standards will be revised accordingly. The policies and standards described in this section reflect those currently in effect.

Infrastructure

The infrastructure is represented by five architectural components (1) networking, (2) computing, (3) storage, (4) access devices, and (5) middleware. Appendix A provides additional detail on the five components of the e-Education Framework infrastructure.

(1) The ITT networking plan is to converge voice, video, and data networks onto the Internet in order to optimize staffing and simplify access to multimedia curriculum and research materials. Climate control and door access technologies as well as many other technologies are moving to Internet Protocol architectures for improved operating efficiency.

(2) The ITT computing plan is to consolidate servers and other computers, cluster them and create grids to increase the utilization of existing computing power. Industry averages for server utilization are in the 10 to 15 percent range compared to 70 percent for mainframes according to David Heap (2000). Through the use of computer clustering and grid computing, the existing processing power can be better protected against systems failures while significantly increasing sharing of computing power.

(3) The ITT storage plan is to consolidate storage into storage areas networks and network addressable storage configurations, which will optimize data and information access, sharing, security and resiliency. Proper management of storage is essential to support theme 3 – content repository.

(4) The ITT device access capabilities plan is to implement wireless technologies and require students to own wireless computing devices, perhaps laptops or Personal Digital Assistants (PDAs) since increasing numbers of students are coming to campus with their own computers. Capitalizing on this trend will significantly reduce the need for as many expensive computing labs while increasing student accessibility to the content repositories of the University.

(5) The ITT middleware plan is to connect the components (networks, computers, storage and devices) into seamless, virtual systems of unlimited computing power, accessing to all data, anytime, anywhere properly secured with access privileges. Internet access (sharing data), grid computing (sharing computers), autonomic computing (self-healing systems), security, web services and resiliency for backup, business continuity and disaster recovery define the key ingredients to connectivity everywhere middleware plan.

Policies

The campus-wide ITT policies are available on the NC A&T SU website:
http://www.ncat.edu/~cit//policies/cmpntwk/toc.php

The policies document on the website is organized into four major groupings:

1. Purpose of the University's computing and networking environment
2. Ethical responsibilities
3. Policies
4. Sanctions for policy violations

The policies cover the following general areas:

- Computer user accounts
- Security
- Networking
- Software
- Hardware
- World wide web
- Academic computing facilities
- Privacy
- Standards

The campus-wide ITT standards are described in five documents available on the web:
http://www.ncat.edu/~cit/policies/ittstandards/toc.php.
1. Administrative Information Systems (AIS) Software and Systems Standards Manual
2. Computing and Networking Usage Policy
3. Campus Standard Wiring Guidelines
4. Licenses and Software
5. Minimum Computer Configuration Required For Service From Aggie Help Desk

Management Process

This section describes key management processes relating to information technology and telecommunications on the campus. Five of the key processes: (1) audit performance, (2) acquisitions, (3) life cycle management, (4) professional development, and (5) disaster recovery and business continuity, for the effective management of information technology, are described.

IS/IT Audit Performance

As the Campus organization responsible for information technology and telecommunications, ITT insures that the University follows accepted auditing practices. The Office of the State Auditor and NC A&T SU's Office of the Internal Auditor periodically perform audits. The last audit by the Office of the State Auditor was performed during Fall 2000. The audit results were very positive with only one major finding relating to campus wide coordination of disaster recovery plans. The University has taken appropriate actions and the finding is resolved. Details of the audit are available at the Office of the State Auditor's website: http://www.osa.state.nc.us/

Acquisitions for Major IT Goods and Services

Information technology and telecommunications goods and services are acquired in accordance with state purchasing regulations, state laws; and state ITS, UNC, and NC A&T SU purchasing guidelines.

All ITT goods and services for University purposes must be approved by the ITT Acquisitions Department prior to submission to the campus Department of Procurement. When it is practical, volume purchases are coordinated through ITT Acquisitions even when there are multiple state, federal, and private funding sources.

IT Life Cycle Management

IT life cycle management is in place for equipment renewal, hardware and software maintenance schedule, Service Level Agreement (SLA) renewals, as well as software upgrades, enhancements, customizations and replacements. Desktops and workstations used in student labs are refreshed every three to four years through leasing programs used to leverage available resources. Faculty, staff and administrative computers are funded by individual departments. ITT makes recommendations and establishes standards for maintenance and support of department equipment. The desktop strategy is to develop and adopt an economical campus-wide desktop replacement program based on a more affordable thin client, Citrix Systems, Inc. enterprise technology where appropriate.

IT life cycle processes are also established for software application development, installation and upgrades. The campus software application development and installation process follows the requirements, design, and implement PMI life cycle guidelines. Two of the key ITT managers are PMI certified project managers. The PMI discipline using Microsoft Project Management is being practiced throughout the ITT organization. A project priority list is maintained by the ITT Division and is reviewed periodically with the Cabinet when there are conflicting priorities, or when project request exceed the capacity of the division to meet the needs.

Network and server replacement cycles are based on guidelines from UNC and available funding. The network equipment is at the beginning of the refresh cycle. Most campus servers are at the end of the refresh cycle and will be replaced and upgraded as funding becomes available.

Professional Development

The cornerstone of the *e-Education Framework* is the learner-centered community. This community of faculty, staff, administrators, and students must be able to use the tools effectively and responsibly to justify rising investments in technology.

The changing nature of technology requires thoughtfulness and diligence in preparing faculty, staff, administrators, and students to effectively utilize technology. The ITT Division is responsible for campus-wide technology professional development. This responsibility is carried out by the Teaching and Learning Technologies (TLT) Unit of ITT that consist of three departments: the Academy for Teaching and Learning, the Center for Distance Learning, and the Department of Teaching and Learning Systems, in conjunction with the Human Resources Department professional developing director.

The campus-wide professional development program focuses on four areas:

- Teaching and learning outcomes
- Technical skill and the responsible use of technology

- Utilization of technology, pedagogy and assessment in the classroom and
- Professional development, particularly as it relates to leadership

Disaster Recovery and Business Continuity Planning

ITT maintains the disaster recovery plan for University-critical ITT applications. The plan is a component of the University Disaster Preparedness Committee. The plan identifies rapid response team members, procedures for establishing critical ITT services at remote hot sites, and measures for returning critical ITT services to normal operation. The University disaster recovery plan consolidates all critical ITT applications into one comprehensive document that is annually reviewed and signed by the Chancellor.

The campus internal auditor department tests selected areas annually at a minimum to ensure that the procedures are functional. The campus is engaged in an intensive readiness assessment and preparation for incidences, emergencies and disasters at the directive of the UNC Office of the President.

Assessment and Accountability

Advocates of assessment and evaluation in meeting accountability standards continue to be an area that falls behind in improving teaching and learning in higher education. However, the "infusion" of new media technologies and new ways to improve instruction are continuously being "identified" (Charp, 2002. p12). Therefore, accountability in a responsive teaching and learning environment with the infusion of managing technology in public higher education is a constant challenge.

As technology continues to be an integral part of the University's teaching and learning success, the Division of Information Technology and Telecommunications recognize and embrace the concept of accountability with high standards through faculty, staff, administrators, and students' productivity.

Accountability in ITT is achieved through a clear understanding of policies and practices established within the overall ITT strategic plan. Ongoing monitoring of assessment and evaluation measures with a reward system and through various communication modes provides an effective and efficient approach.

ITT establishes accountability measures with the various departments, units, and constituencies throughout the University in implementing the Service Level Agreements (SLAs). The SLA is a document that describes the performance agreement between the client and the different ITT service units. Within the SLAs, client expectations and ITT service capabilities are decided. These agreements are the basis for assessing the quality of service provided by ITT.

All ITT projects are assessed and evaluated against a set of criteria related to performance expectations/goals, SLAs, ongoing feedback related to the project timeline,

impact that the project has on the learning community, and budget cost effectiveness. The budget includes the overall project cost, operating cost reduction or increase, cost avoidance, and opportunities for revenue growth.

At the end of each academic year, the Division of ITT prepares and submits an annual report to the Provost/Vice Chancellor for Academic Affairs at North Carolina A&T State University. The report is reviewed with key ITT administrators examining the overall performance of the Division. The reviews provide input to the plans and performance goals for the next year. All employees in the Division of ITT receive copies of this final document and participate in forums to review the effectiveness of the ITT organization.

Funding

The Division of ITT collaborates with the UNC, state, federal and private agencies to secure adequate funding. The current sources of funds are: state budgets and bond allocations, Title III, and a corporate grant totally approximately $7.3 million. The dollar amounts vary year to year, however, the pie chart depicted in figure 8 illustrates the percentage of funding from each source.
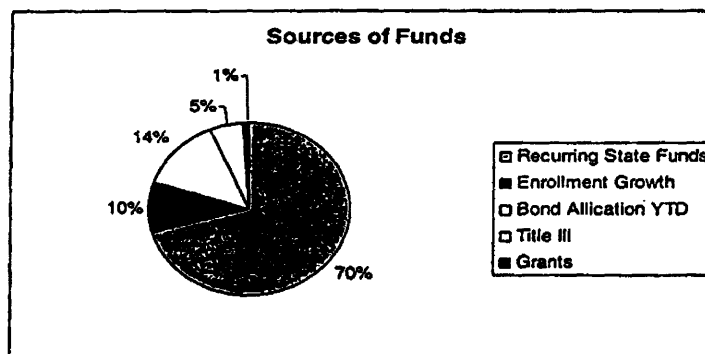

Figure 8 – Sources of Funds

The ITT State Budget is used primarily for staff salaries and benefits, equipment upgrades, replacement and repairs, replenishment of supplies, and renewals of licenses and equipment maintenance. The recurring portion of the state funding is approximately $5.1 million. Currently, the State budget does not allow for sufficient funding for professional development and travel necessary to maintain and enhance ITT personnel skills necessary to adequately support the University. The allocation of state funding is depicted in figure 9.

State Funding Allocations

- Personnel
- Equipment
- Maintenance & Licenses
- Travel & Training
- Supplies
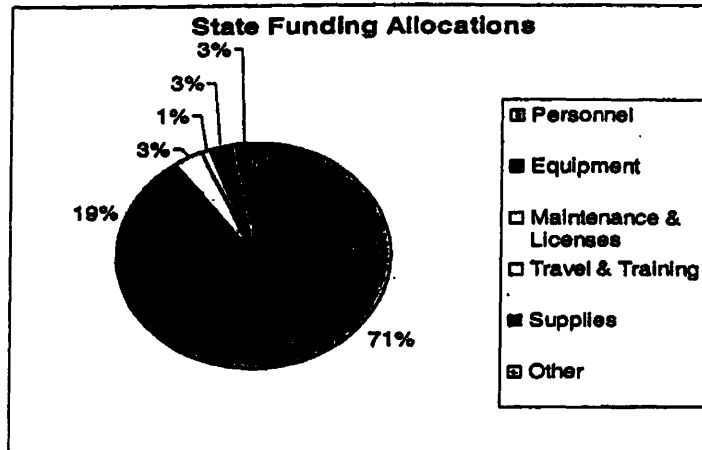- Other

3%
3%
1%
3%
19%
71%

Figure 9 – State Funding Allocations

The reduction in state funding has created a significant ITT challenge for the University. The impact of the budget cuts is severe. Aging equipment is increasing the number and severity of service calls with no increase in staff. The results is a significant decline in service to clients. This effect is coupled with the dramatic growth in student enrollment at NC A&T SU, causing a rising demand for technology to support the classrooms, the networks, the labs and administrative operations. The only reasonable alternative is to use existing resources more efficiently, reduce services and seek alternate sources of funds.

A key tenet of the ITT strategy is the judicious use of technology resources. The restructuring of the information technology and telecommunications organization is providing an opportunity to reduce costs while improving overall support and quality by using resources more effectively. This will be accomplished through the creation of server farms that reduce the number of standalone servers currently installed throughout the campus, thin-client desktops, and grid computing. Purchases of products and services from state funding and grants can now be better coordinated since all technical resources are managed together and coordinated by ITT.

The bond funding provides some relief because it is being used to fund the completion of the baseline network, defined in the UNC IT Strategic Plan, and to begin the implementation of the converged network. The remaining work required to complete the baseline networks is to provide network security, network redundancy, and renovate the wiring closets in all campus buildings.

Student technology fees are used primarily to maintain and upgrade 24 campus computer labs. ·Approximately 50 students are employed in the labs part-time to provide oversight and support. These students are the backbone of the Student Technical Services (STS) organization.

ITT recently received a $65,000 grant from IBM to begin the development of a research grid. The research grid will significantly enhance the ability of faculty to engage in collaborative, interdisciplinary research through the shared computing and storage resources. The research grid also enhances the portfolio of the of faculty who are seeking grants because the granting agencies often want to know what access they currently have to technology to facilitate their research.

Some of the key benchmarks being used to manage ITT expenditures are:
- Student-Faculty-Staff supported per ITT Staff Member – there are approximately 100 clients support by each ITT staff member
- Computers Supported per ITT Staff Member – there are approximately 50 computers supported per ITT staff member

These initiatives will reduce the total cost of ownership and provide a better managed environment that supports the Board of Governors, the UNC and the University strategic directions.
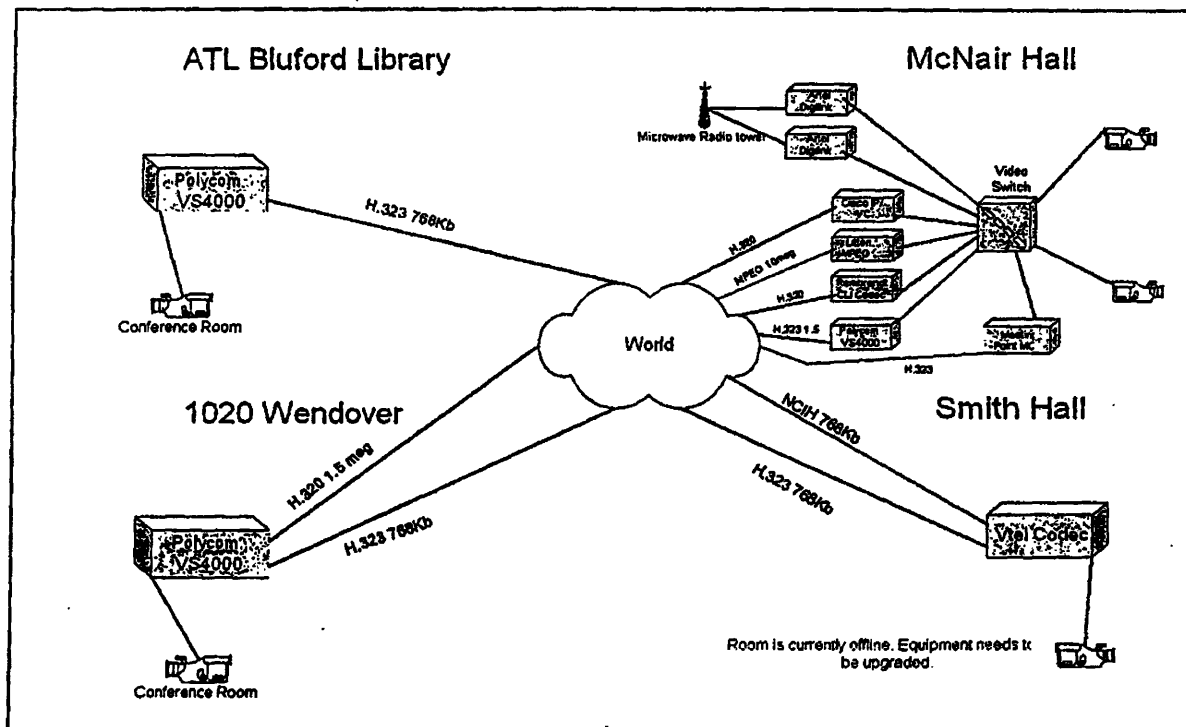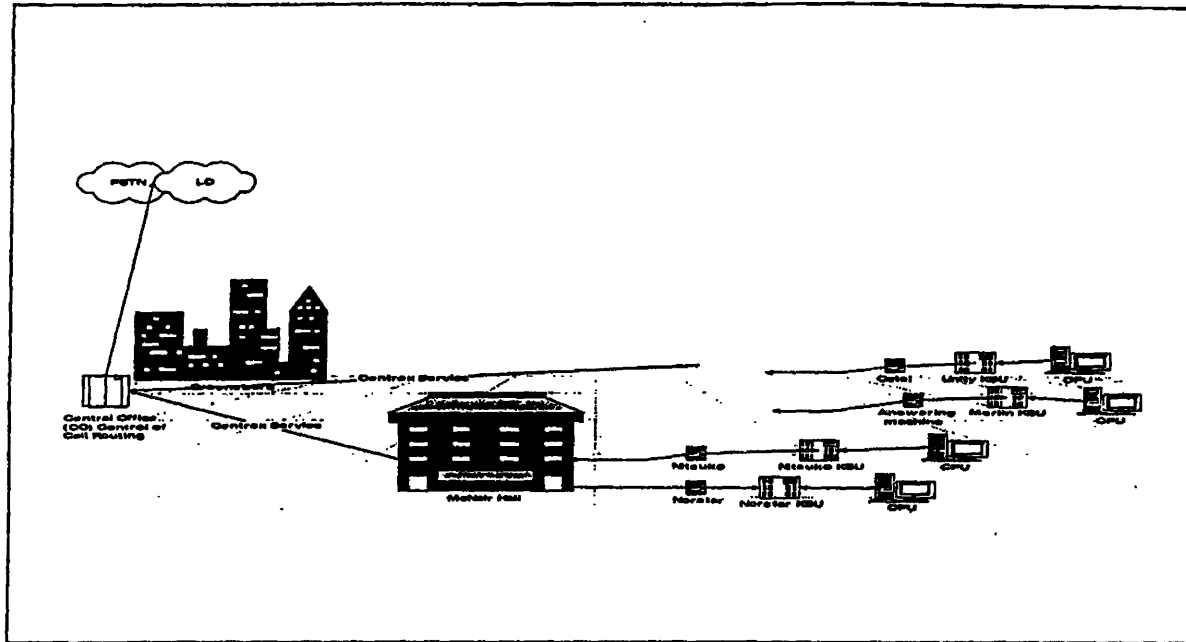
Conclusion

This document is intended to provide evidence of sound IT management practices, thoughtful strategic planning, and effective execution and performance. IT management is based on knowledge about technology trends, understanding of technology, appropriate application of technology, and the role of technology in accelerating organizational change. This document demonstrates IT management practices that reflect the priorities and plans of the campus, the UNC, and Board of Governors in the its organizational structure, infrastructure standards, polices and processes; as well as through the operation of effective processes for assessment, accountability and fiscal responsibility. The document also demonstrates that the ITT strategic plan reflects the commitment to develop the ITT infrastructure to meet future campus requirements without financially burdening the UNC.

North Carolina Agricultural and Technical State University has a successful track record of performance and management of the ITT infrastructure which is strengthened and made possible by the support and guidance of the UNC. Through this continued collaboration, the associations with academic and industry colleagues, regular assessment, evaluation and revision, the Division of Information Technology and Telecommunications intends to carry this tradition of excellence forward and has a comprehensive, aggressive plan to address the growing demand for service evolving from the interdisciplinary community at NC A&T SU.

North Carolina Agricultural and Technical State University requests authorization to exercise management flexibility in the planning, acquisition, implementation and delivery of information technology under G.S. 116.30.1.

Appendix A - The e-Education Framework

The *e-Education Framework* will build upon the existing network infrastructure, computing capacity, storage management, access capabilities, and middleware based on the content, accessibility and functional needs of various campus divisions and offices.

The campus network in figure 3 depicts the current network consisting of a 1-Gb fiber backbone with 100-Mb pipes to all building on the campus. The network connects to the Internet through the a 1-Gb RPoP (Regional Point of Presence) switch located off campus that connects to the NCREN packet-over-sonnet network. The campus network needs to be upgraded to enhance security and add redundancy to eliminate the remaining single points of failure.

Figure 3 – Data Network

The voice and data networks, depicted in figures 4 and 5, are separate from the data network and are managed by additional staff. The network plan is to converge these networks into one consolidated network, depicted in figure 6, managed by a single network staff. The two video conferencing centers in Smith Hall and Web Hall are not included in the figures.
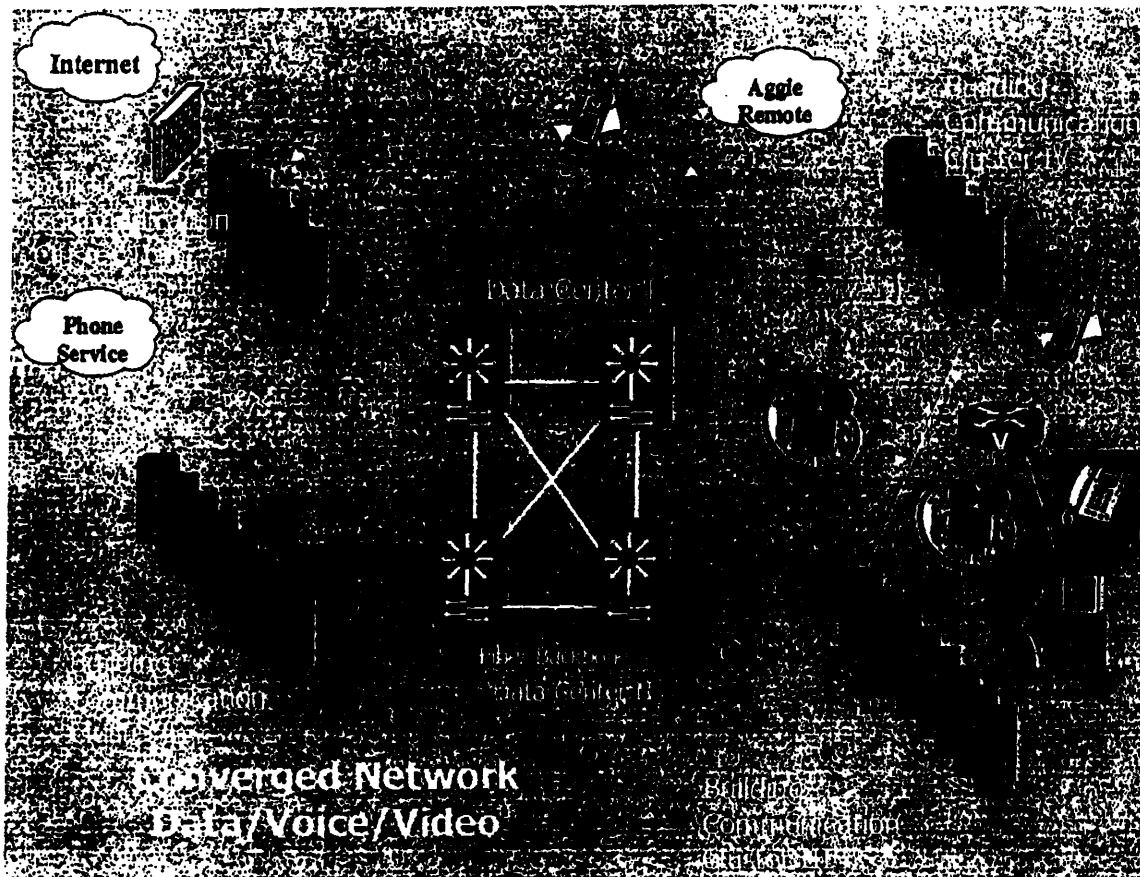
Figure 4 – Voice Network

Figure 5 – Video Network

Figure 6 – Converged Voice, Video, Data Network

The network will be supported by a back-office computer infrastructure of 2 data centers, located on opposite sides of the campus, serving the general needs of the campus, 24 computer labs providing a total of 500 desktop computers available to 9000 students, approximately several hundred stand alone department servers and several specialized research labs throughout the campus. The strategic direction for computing capacity is to consolidate the servers into a clustered server farm, create a research grid, and reduce the number of computer labs when the campus adopts a policy to require students to have their own computers.

Storage requirements for the campus are currently being managed in the two data centers utilizing the traditional approach where each server manages its own storage. Storage needs are continuing to grow exponentially on the campus. The storage strategy is to get better storage utilization by taking advantage of storage area networks and network addressable storage configurations to better manage campus storage capacity.

The primary access devices utilized on the campus are multi-vendor desktops, laptops, standalone printers, scanners, and a few PDAs (Personal Digital Assistants). Wireless

access is available in several areas around campus. The most notable wireless area is the Bluford Library which is wirelessly enabled on all floors. One hundred notebook computers are available for checkout for students to use anywhere in the library for computing. The accessibility goal is to enable the entire campus for wireless communications and utilize the most current and practical pervasive computing devices available. Dell, Compaq, Sun, Gateway, and IBM are the primary workstation suppliers. ITT is working on a standard to optimized and leverage the purchase of computers and peripherals.

The campus middleware consisting of back-office software, and web services support including the use of portal technology, serves the current needs of the University. However a pressing need exists for increased security and backup/recovery processes for disaster recovery and business continuity. The current plan is to install more robust middleware that incorporates the implementation of grid computing (sharing computing power), autonomic computing (self-healing systems) and increased resiliency for security, backup, business continuity, and disaster recovery.

The mission critical software infrastructure used throughout the campus to support all functional areas is depicted in figure 7.
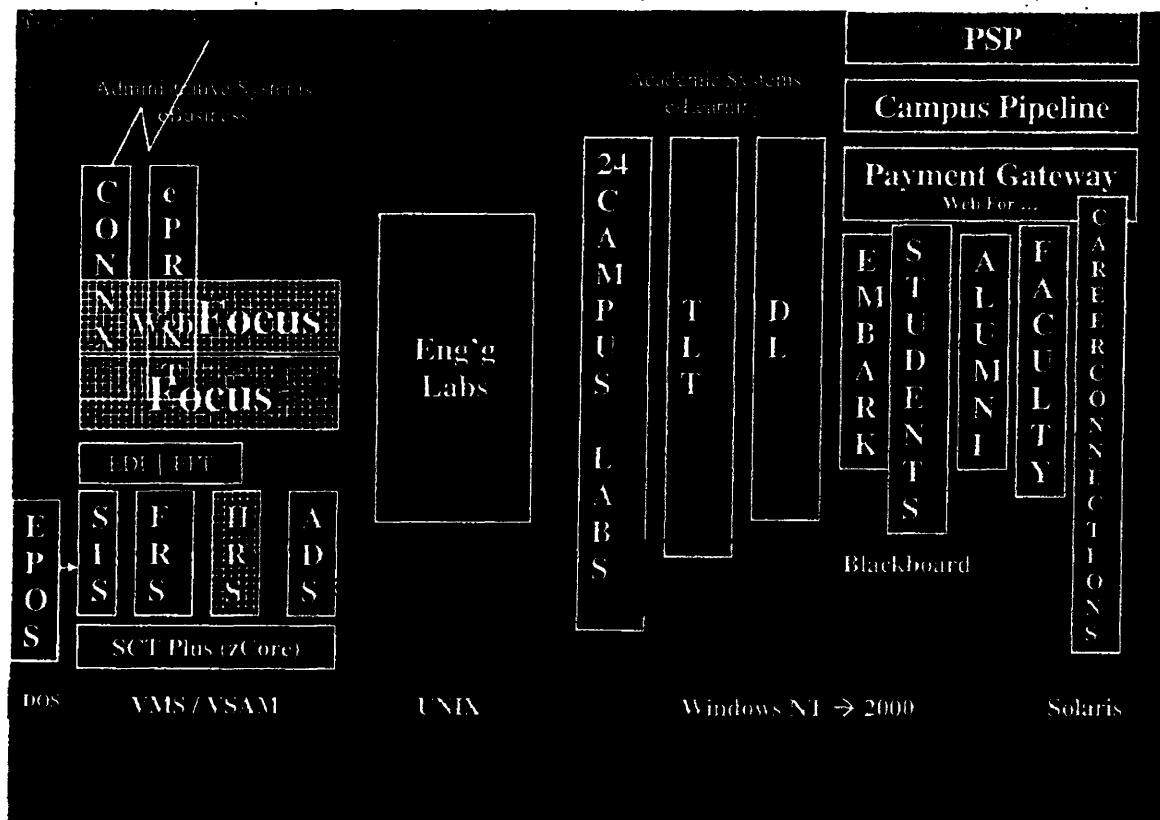

Figure 7 – Software Infrastructure

The current software infrastructure is sufficient to support the present needs of the University, but is not adequate for the future requirements of the Interdisciplinary University vision. The need for significantly increased collaboration with the expanding local, regional, national, and international learner-centered community place increased demands on the infrastructure and support that exceeds current capacities and capabilities. A key strategy for addressing these needs is to use existing ITT resources more efficiently. Consolidation is an important way to accomplish efficiency. The current infrastructure has too much variation in operating systems and subsystems which require the employment of costly specialized staff to support each system and application variation.

The current inventory of software applications and supporting systems reflect the typical growth strategy of many universities and some corporations. The growth strategy was, by default, to continue to build on existing technology without reengineering the architecture, resulting in the proliferations of heterogeneous systems and dependency on legacy applications accessed through state-of-the-art front-ends. The most serious deficiency in the current architecture is the SCT Corporation's Virtual Sequential Access Method (VSAM) database used in their SCT-Plus system that serves all major administrative applications: (Financial Resource System) FRS, (Student Information System) SIS, Human Resources System (HRS) and Alumni Data System (ADS). The migration to a relational database system like Banner is essential. In anticipation of the migration, the University has selected the Oracle Database products as the campus standards.

References

Charp, S. (2000). Assessment and Evaluation. Tustin, California. Technological Horizon in Education page 12.

Collins, James C. (2001). "Good to Great: Why Some Companies Make the Leap ... and Others Don't." Harper Business, New York pages 13-14.

Fullan, Michael and Stiegelbauer, Suzanne, (1991). "The New Meaning of Educational Change." Teachers College Press, New York.

Fullen, Michael. (1993). "Change Forces: Probing the Depths of Educational Reform." The Falmer Press, New York.

Fullen, Michael. (1999)). "Change Forces: The Sequel." The Falmer Press, New York.

Gerstner, Louis V. (2002). "Who Says Elephants Can't Dance?: Inside IBM's Historic Turnaround." Harper Business, New York.

Green, Kenneth C., (2002). "Campus Computing 2002: The 13th National Survey of Computing and Information Technology in American Higher Education." The Campus Computing Project, Encino, CA.

Heap, David, (2000). "Scorpion – Simplifying the Corporate IT Structure." IBM, Armonk, NY. dheap@us.ibm.com. http://www.ibm.com/news/us/2002/10/082.html.

Jossey-Bass. (2000). "The Jossey-Bass Reader on Educational Leadership." Jossey-Bass, San Francisco.

Kaplan, Robert S., Norton, David P. (1996). "Translating Strategy into Action: The Balanced Scorecard." Harvard Business Review Press, Boston, Massachusetts.

North Carolina A&T State University. (April 2001). "Aggie Report: Special Edition."

North Carolina Agricultural & Technical State University. (February 2003) "Uncompromising Excellence: A Blueprint for the Future." North Carolina A&T State University, Greensboro, NC.

Richmond, Barry. (2001). "Stella Software: An Introduction to Systems Thinking." High Performance Systems, Inc. Hanover, NH.

Senge, P.M., Cambron-McCabe, N., Lucas, T., Smith, B., Button, J., Kleiner, A. (2000). Doubleday, New York.

Senge, P.M., Kleiner, A., Roberts, C., Ross, R.B., Roth, G., Smith, B. (1999). "The Dance of Change: A Fifth Discipline Resource." Doubleday, New York.

Senge, P.M., Kleiner, A., Roberts, C., Ross, R.B., Smith, B.J. (1994). "The Fifth Discipline Fieldbook: Strategies and Tools for Buidling a Learning Organization." Doubleday, New York.

Senge, Peter M. (1990). "The Fifth Discipline: The Art & Practice of the Learning Organization." Doubleday, New York.