New Jersey System of Public Research Universities
Review, Planning, and Implementation Steering Committee

Principles and Framework for Providing IT and Library Services to the Public Research Universities of New Jersey

FINAL DRAFT

A White Paper Issued by the System-wide
IT and Library Services Issues Working Group

October 17, 2003

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I. INTRODUCTION

In 2002, Governor McGreevey created the Commission on Health Science, Education and Training. He charged the Commission with assessing the status of medical and health care training in the state and formulating recommendations to:

- Enhance the quality of education
- Increase overall competitiveness as institutions of health care learning
- *Foster healthy synergy among the institutions*

As a result of its study, the Commission recommended the creation of a single New Jersey public research university system that builds on the collective strengths of NJIT, Rutgers and UMDNJ and provides an effective platform for excellence in both health and non-health disciplines.

The Governor issued Executive Order 42 establishing a Review, Planning and Implementation Steering Committee to:

- Review the impact of the Commission's recommendation to create a comprehensive plan for restructuring New Jersey's public research universities
- Facilitate the collection of information pertaining to the restructuring
- Examine and prioritize specific strategies to restructure the three public research universities
- Outline a proposed work plan
- Deliver an assessment and implementation interim report to the Governor

The Steering Committee created several subcommittees and working groups to undertake the planning effort. This White Paper has been issued by one of the working groups — the System-wide IT/Library Services Issues Working Group.

The Charge to this Issues Working Group was to assess the library and information technology needs of the future reconfigured public research universities, and to create a model of how such services could be delivered to fulfill the opportunities presented by this restructuring of the three universities.

II. APPROACH AND METHODOLOGY

To fulfill the Charge from the Steering Committee, the IT/Library Issues Working Group was constituted consisting of the lead IT and Library personnel from each of the current research universities (New Jersey Institute of Technology, Rutgers, and University of Medicine and Dentistry of New Jersey). A co-chair of the Working Group also served as liaison to the Steering Committee for input from the activities of senior planners. (See Attachment 1 for a listing of Working Group participants.)

The Working Group made certain assumptions as to the expected business model for the future University System, based upon the Charge given to the Working Group and other information created by other planning groups. The Group also defined the scope of "IT and Library services" to be considered as outlined below:

- Networking and Infrastructure
  e.g., systems administration, security
- Administrative Systems
  e.g., human resources, student systems, business/financial services
- Academic Support
  e.g., learning management systems, instructional technology, distance learning
- Research Support
  e.g., classified research, high performance computing
- Library Systems and Services
- Information Management
  e.g., data warehousing, data mining, data administration
- Health Care Information Systems

As an approach to proceeding with this planning reflective of a broader input, the Working Group established four Task Teams. These Task Teams were charged to consider the planning issues from varying perspectives and to thereby develop a Vision for delivery of IT and library services from these perspectives. The Task Teams included:

- System-Level IT & Library Services
- University-Level IT & Library Services – North University
- University-Level IT & Library Services – Central University
- University-Level IT & Library Services – South University

Utilizing the valuable and detailed input available from these Task Teams, the Working Group synthesized their results into the recommendations leading to this report. In some instances the Task Team feedback was adopted in whole or in part; in other instances the Working Group elected to modify some recommendations. The result described in this report is a high-level model for configuring the delivery of IT and Library services to the newly configured research Universities and a planning framework for accomplishing that model.

In preparing this report, the following terms and definitions have been utilized:

- "*University*": any one of the newly reconfigured universities to be located in the North, Central and South regions, reconfigured from the current programs, services and resources of the present NJIT, Rutgers, and UMDNJ.
- "*Campus*": a distinct geographical location for a particular segment or sub-entity within a University.
- "*University System*": The collective entities of the North, Central and South Universities and the Chancellor's Office.

III. BUSINESS MODEL ASSUMPTIONS

The Working Group acknowledges that today there are a variety of ways in which IT and Library services can be organized and delivered. There is no inherent "right or wrong" manner in which to accomplish this. Rather, selecting the appropriate approach to be utilized depends upon a number of institutional factors. IT and Library services *support* the core mission of a public research university, and their configuration should ultimately reflect institutional decisions about the priorities and directions of those core mission activities.

Clearly, for this planning project many of those institutional business decisions have not yet been determined and are being determined concurrently with the planning efforts of this Working Group. A final assessment of Library and IT needs for the future research university system cannot be completed until these decisions have been made. In order to facilitate the accomplishment of our Charge, the Working Group worked within the following assumptions as to the Business Model for the University System:

1. The Chancellor's Office is assumed to be a lean organization, with a primary emphasis on coordinating *external* affairs. While it is expected that the Chancellor's Office will encourage and promote internal synergies and coordinated activities among the universities, the Chancellor's Office is not presumed to be an operational center for the delivery of IT or Library services;

2. The Universities will be generally expected to operate semi-autonomously while concurrently supporting the need for, and opportunities available from, a University System framework;

3. Each University will evolve its own distinctive mission and educational niche and characteristics built upon its inherent strengths ("institutional assets") and guided by guidelines from the Chancellor's Office;

4. The Universities should leverage whenever possible library and IT assets necessary for a successful, competitive research institution, and act in cooperation and collaboration so as to minimize duplication and increase efficiency and effectiveness.

5. Academic and research programming will be determined at the University level within University System guidelines, including such things as locally-determined admissions standards, course registration, and curriculum offerings and development; and

6. Within the above, it will therefore be necessary for the Universities to achieve a *balance* between local operations and decision-making vis-à-vis University System-wide synergies and collaboration.

Other Planning Parameters

In addition to the business model assumptions described above, the Working Group made no assumptions about costs, resource availability, or levels of inter-institutional collaboration for such things as cross registration or cross teaching at this phase in the planning. As these factors have not been determined for the future University System, it was considered to be inappropriate for the Working Group to predicate its recommendations on these unknowns. As the business model and funding resources are clarified by the Steering Committee in future deliberations, the Working Group would expect its recommendations to be modified appropriate to those clarifications.

Further, the Working Group did not focus at this time on considerations of the implementation effort that will be required to achieve this transformation. The Vision presented here represents a "targeted steady-state" for IT and Library service delivery. We did not condition our thinking on the very difficult transition issues that these will cause, but we assume that those details will be deferred to appropriate detailed planning and implementation teams to resolve accordingly. (See Section VI., "Transition Planning.")

IV. RECOMMENDED SERVICE MODELS AND MAJOR MILESTONES

Based upon the business assumptions described above, the Working Group envisions the following models for the delivery of IT and Library services to the three Universities:

1. Each University will be responsible for providing IT and Library services to its local constituencies, including students, faculty, and staff on-campus, as well as to affiliated agencies and other constituencies or inter-relationships to be served.

2. Local services will be organized and delivered in the manner and structure most appropriate to each University's priorities, resource needs, and programmatic and mission focus. Various service responsibilities may be accomplished through a combination of University-provided resources, services obtained from a sister institution(s), or from providers outside of the University System.

3. In fulfilling its responsibility for IT and library support services, each University will work together to exploit available synergies from inter-University cooperation, initiate joint development and partnerships, and develop common standards and definitions which can facilitate inter-University sharing so as to support the strategic objectives of each University.

In structuring local support, each University will be obligated to support three levels of overall service requirements:

1. Local support and operational needs, with responsibilities and resources to be appropriately distributed between centralized University IT and library functions, and distributed functions within individual University departments and surrounding affiliates;

2. University-System needs, supporting inter-University activities as well as the requirements of the Chancellor's Office (a new and emerging requirement for the Universities to be clarified); and

3. Universal access needs, for regional/national/international connectivity, and two-way teaching and research activities across distances.

It is important to note that the future University System has excellent experiences and platforms upon which to build. There is already an existing history of cooperation and joint activity among the three current institutions in communicating, developing and utilizing shared efforts to meet local needs. This history provides a significant springboard for the future. Also, in the arenas of networking and Internet access, as well as with access to library collections, each existing university has long been active in designing technology systems and processes that allow their constituencies to interconnect and interact beyond the local campus base of activity. This experience creates an existing foundation of working together from an inter-institutional perspective.

V. VALUES AND PRINCIPLES

Looking ahead at potential implementation considerations, the Working Group and its Task Teams developed certain Values and Principles to guide future detailed planning efforts. In translating its vision and model for IT and library services into actuality, it will be important to have these Values and Principles as a backdrop in determining future technology designs and courses of action.

1. There will be a strong need to develop technical standards, data definitions and performance measures across the three Universities. Each of these common understandings will then need to be operationalized locally at each University.

2. IT and library resources and services should be based on common technology standards to promote system-wide interoperability that will enable students, faculty, staff, and others within the system to take advantage of, where appropriate, resources and services across the system, and for achieving desired synergies. While in general, each individual institution would select the hardware and applications software that best meets that institution's needs, some applications should be viewed from a system-wide lens to promote interoperability. These applications can only be identified at a later date when levels of inter-institutional collaboration in day-to-day operations are clarified. System-wide requirements to standards that will facilitate interoperability will be needed in these application areas.

3. Technology applications will need to be responsive to local University needs. But, they should not be designed so as to *preclude* the easy sharing or consolidation of information or future interoperability among the Universities.

4. Data warehouses for management reporting and oversight purposes are normally built assuming that the data will be pulled from disparate systems. Shared standards in areas such as data definitions, charts of accounts, and process cycles should provide standard budgeting and reporting results, along with general knowledge sharing, across the University System without requiring centralized or even homogeneous operational information systems.

5. Each University should maintain and support a robust application, networking and telecommunications infrastructure that is responsive to its mission. These infrastructures could be interconnected using the same industry established principles that were used to build the Internet. High-performing network infrastructures will encourage system-wide collaboration making it possible to conduct teaching and research in parallel at distant locations. System-wide fiscal efficiencies might also be achieved through time sharing of expensive scientific instruments such as remote scanning electron microscopes, stellar observatories, and MRIs over a high-speed integrated network.

6. Applications should be seamless locally to provide for ease of access for constituents, and they should be interoperable among the universities in areas determined to be appropriate for inter-University cooperation and sharing or centralization. Necessary network security barriers will need to be in place for each University to protect properly the integrity of local data and resources.

7. In looking for appropriate synergies within the University System, a considered *balance* in the deployment of resources on a campus, among campuses within a University, and across the University System is key to effective utilization and sound financial management. Detailed decisions must necessarily wait for future phases of University System planning, but certain higher-level principles can be articulated early on. The current institutions that will make up each new University have already embraced technologies that are both effective and key to their individual current missions. The coordination of resources and management thereof must necessarily preserve and enhance the assets already available.

   At the same time the whole must greatly exceed the sum of its components if each University is going to move further into the top tier of research universities. Therefore it will be important that the Universities look at all state-wide assets and entities that can facilitate desired synergies, and where appropriate revise and/or develop new such entities to promote synergistic actions. (See Attachment 2 for specific examples of potential University System synergies.)

8. The three universities should collaborate to provide system-wide authentication and authorization systems for those applications and services that will be shared.

9. Significant economies of scale can result from a collaborative approach to licensing (e.g., software, library databases) and other common technology expenses (e.g., hardware acquisitions, maintenance contracts).

10. In order to realize the full potential from this reconfiguration initiative, both locally and across the University System, each University at a future time will need to move toward an integrated platform of enterprise application systems. At one time universities referred to such application systems as "administrative computing." However, the need for integrated systems that support business, teaching, and research processes across the enterprise now makes that term obsolete, blurring applications that once might have been segregated to "administrative" or "academic" domains. Learning management systems must tightly integrate with student registration systems for optimum effectiveness. Enterprise operational systems (e.g., registration, admissions, finance) support core business processes and capture basic transaction information that becomes the basis for management reporting and decision support systems. Grant management systems must necessarily integrate with many of the other core administrative systems within the University.

11. As each University progressively moves toward newer and integrated system platforms to enhance its service to constituents, similar strategies will need to be developed for advancing IT and library support to a level commensurate with the academic and research aspirations of that University and the University System as a whole.

12. Health care information systems, e.g., clinical hospital and faculty practice information systems might be classified as a subset of enterprise application systems by some. However, the complexity and privacy requirements of these systems and their organizational design merit a separate consideration, and usually require such services to be provided "close to the user."

13. IT and Library services exist to support the teaching, learning and research missions of the Universities. It is therefore important that public computing facilities, general user support services, and specialized faculty support for instruction and research efforts be fully existent and supported at each University.

14. Technology can and will be used as a competitive edge for each University for specific topics or niches, and this may properly drive any University to unique IT implementations appropriate to its overall benefit.

VI. TRANSITION PLANNING

In incorporating the Values and Principles described above, various additional planning phases are assumed to be required. In any transition of IT and library services from one steady-state to another, or from one provider to another, careful and detailed planning is needed to avoid undue disruption of University functions and services.

Preventing a "loss of access to current resources and services" for faculty and students should be a priority goal during future implementation. Although some disruptions may be unavoidable, implementation plans should be crafted so as to minimize this potential. Transition strategies need to allow for a concurrent "continuation while transitioning" approach. The IT/Library transition will further need to be planned within the parameters of changes that will be determined in the mission and programmatic content of each new University. Further, senior planners will need to clarify to what extent synergy and collaboration among the Universities will be "desired" versus "required."

It is recommended that implementation planning be done in the major phases shown below. In *general* (and with some warranted exceptions), the basic strategy would be first to get each University *operational* within its new configuration, to be followed by effecting synergy goals and service advancements in support of moving that University towards its strategic goals and its aspirations for professional recognition.

PHASE 1 – Effect Operational Responsibilities:

Step 1: Create a detailed inventory of the current IT and library assets. Once the programmatic transfers and reallocation of current programs and entities in the new Universities has been finalized (including the Chancellor's Office), develop an inventory of the IT and Library service needs.

Step 2: Identify the appropriate resources, technologies and organizational structure(s) to provide each of these services within the existing "best of breed" products/services/skill sets to be found within each University (or other provider within/outside the University System); and

Step 3: Develop a plan and schedule for implementing these services and migrating data over an appropriate and extended timeline and in multiple stages. (This will require integrated planning and implementation coordination among the Universities due to the interdependent "from/to" changes that will be involved.)

PHASE 2 – Begin the move to New Synergies and Collaborations:

Step 1: Create various appropriate forums across the Universities for sharing information and planning, and for coordination where decisions are made to move forward jointly.

Step 2: Identify areas for possible and desirable movement towards common platforms and/or joint ventures, taking advantage of opportunities presented at the time of technology replacement.

Step 3: Utilize currently available forums and entities, or develop new ones, to effect across the Universities the synergies identified.

It should be reaffirmed that each University will be in a different position at its start-up point. The goals of self-responsibility and self-sufficiency while concurrently achieving University System objectives and synergistic benefits will be the same for each, but the migration strategies will necessarily be significantly different for each entity depending upon its unique starting point.

ATTACHMENT 1:

Working Group and Task Team Participants

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Working Group and Task Team Participants

IT/Library Issues Working Group:

Dr. Robert Altenkirch, President, NJIT (Co-Chair)
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Ms. Marianne Gaunt, University Librarian, Rutgers (Co-Chair)
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Mr. Michael McKay, Executive Director of Computing & Information Technology, Rutgers
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IT/Library Task Team – System-Wide:

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IT/Library Task Team – University North:

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Mr. Glen Goldman, Professor, NJIT
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IT/Library Task Team – University Central:

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Ms. Bernice Ginder, University Director, Administrative Information Systems & Planning, Rutgers
Dr. Charles Heidrick, Brunswick Computing Services, Rutgers
Ms. Kerry O'Rourke, Library Director, UMDNJ
Dr. Frank Sonnenberg, Associate Director for Clinical Informatics, UMDNJ

IT/Library Task Team – University South:

Ms. Tisha Calvarese, Director, IST for Southern Region, UMDNJ
Dr. Gary Golden, Director, Robeson Library, Rutgers
Mr. Stan Kolasa, Associate Director, Computing Services, Rutgers
Dr. Paul Mehne, Associate Dean for Academic & Student Affairs, UMDNJ
Mr. James Nettleman, Collection Development Librarian, Rutgers
Ms. Janice Skica, Library Director, UMDNJ

ATTACHMENT 2:

Examples of Potential IT Synergies for the University System

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Examples of Potential IT Synergies for the University System

The following are examples of some potential areas where synergies among the Universities could be supportive of local missions, strategic plans, and operational efficiencies. All existing or new state-wide assets and entities that can facilitate these synergies should be evaluated as to their potential to promote desired synergistic actions.

- System-wide shared standards should be established to guide the 3 universities in the development of their IT systems.
  - Standards for WAN handoffs
  - Data warehousing and mining use to provide combined data sharing
  - Disaster recovery and business contingency plans

- Portions of the IT systems may be coordinated or rolled up to support all three universities (North, Central, South). Examples include:
  - Identity management
    * Common database standard accessible within the University System
    * Used to support access to system-wide resources such as:
      -- library access
      -- cross-registration
      -- super-computing facilities
      -- parking systems
      -- building access and public safety
    * Could be facilitated by LDAP system redundantly configured in North, Central and South
    * Data could be fed from North, Central and South's system using common standards to allow for access across Universities
  - Super-computing
    * Greater economy of scale if shared among all three universities
    * Common facility

- Certain IT systems will need to be locally managed by each University to be responsive to local needs and cultures. E.g.:
  - Health care/hospital information systems
  - Portals
  - Administrative systems such as:
    * HR
    * Registration
    * Alumni and Development
    * Finance
  - Telecommunications and networking within a University
  - Local authentication/file systems
    * MS windows domain(s)/active directory (scaling issues apply)
    * Centralized file management

ATTACHMENT 3:

Task Team Reports

System-Wide Task Team

University North Task Team

University Central Task Team

University South Task Team

NEW JERSEY SYSTEM OF PUBLIC RESEARCH UNIVERSITIES
SYSTEM PLANNING PROJECT

VISION FOR SYSTEM-LEVEL IT & LIBRARY SERVICES

IT/ AND LIBRARY SYSTEM-WIDE TASK TEAM

REPORT

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September 10, 2003

IT/AND LIBRARY SYSTEM-WIDE TASK TEAM REPORT

Scope of Task

The System-level Task Team has developed a high-level *Vision* that resulted in a set of *Principles* that should guide the design, delivery, and scope of technology and library services delivered across the three semi-autonomous Universities that will function *within* a System framework. Our intent was to remain at the strategic, rather than tactical, level in considering IT and Library Services for "New University."

Vision

The universities created by the restructuring reflect and are guided by the concept of "competitive collaboration." This means that each of the universities should have a distinctive competency that gives it a competitive advantage over the other universities in the System in a particular area or areas (or why restructure?), but at the same time each of the universities should collaborate to attain resource effectiveness and efficiency with interoperable systems that enable them to do so.

Planning Principles for System-Wide Resources and Services

Given the need to provide system-wide collaboration and coherence of a single University System while also providing sufficient institutional autonomy to support the mission differentiation of the newly configured universities, we recommend the following *planning principles* to guide the provisioning and implementation of information technologies and library services as part of the proposed restructuring.

- Faculty and staff at all three universities should retain universal, seamless access to networking, applications, services, and resources, and the new library/IT infrastructure should focus on extending and improving this access to support all the New Jersey research universities. This "given" enables the restructuring to provide a solid base for the further growth and development of the New University system.

- "Seamless access" to resources and services encompasses the mission (e.g., teaching, research, community outreach, and clinical support) of the universities. This means, for instance, that faculty can teach collaboratively across universities and students can take courses at any university without adding unnecessary complexity to degree audits, issuing of grades, or transcript generation.

- Seamless access requires core technologies, particularly a common authentication and authorization system to create a community of trust across the three universities. A common data and service model will be needed with core entities ("faculty member," "student," "course," "course session," etc.) and relationships between entities defined for explicit mapping across applications so that teaching, research, and administrative activities across the institutions are transparent to faculty, student, and staff users.

- While the three universities will collaborate to maintain and extend access to network infrastructure and resources, each university will develop according to its unique mission and responsiveness to local needs, leveraging expertise and strengths that are customized to each organization. The three universities will develop along distinct paths to be competitive with similar universities within the U.S., but also to compete among themselves for the best students, faculty, and funding resources within the state and externally.

- The Library and IT infrastructures must support this competitive development, which requires the ability to segregate differential applications, resources, and services to the specific university developing them.

- The Library and IT infrastructure must support the dynamic development of "communities of interest" across the state, the U.S., and the world. There must be global standards that enable collaborative access to IT resources and allow the establishment of dynamic "communities of interest" in the global research, education, and community outreach environment.

- Both Library and IT resources and services must be based on common technology standards to promote system-wide interoperability enabling students, faculty, staff, and others within the system to take advantage of resources and services anywhere within the system. While each individual institution may select the hardware and applications software that best meets that institution's needs, there should be system-wide requirements for adherence to open standards that facilitate interoperability.

- Where feasible, and to the extent possible, system-wide economies of scale should be attained through leveraging the collective buying power of the three universities for resources such as Internet services, equipment acquisitions, software site licensing, course management systems etc., as well as electronic information resources.

- The System-wide group must develop common key performance indicators and assessment models to enable evaluation of the three universities. This does not preclude each university having unique performance indicators related to its mission and goals, but enables an overall assessment of the progress of the University System.

Library System

There should be one integrated, unified single research library system for "New University."

- The Library System will provide seamless access to a commonly-held research library collection and research-oriented subscription base of electronic databases and resources.

- The resources held by the members of the New University system will be leveraged for the common good of all participants through robust, readily available access.

- The Library System will develop a uniform interface that supports seamless transitions among the multiple information resources needed by the University community and the community at large.

Information Technology System

An information management *culture* needs to be developed that fosters accessibility to University communities while preserving and protecting the diverse data held in clinical and research databases. The IT Systems-wide group must develop and review on an ongoing basis information policies, procedures, and standards that ensure seamless access while safeguarding system and record security and promote compliance with legal requirements. The New University must provide to all campuses and remote distance learners consistent and uninterrupted access to the University network and educational content.

- Whether there is one central system that all three universities utilize, or three separate systems that are compliant, there must be a dictionary/glossary of terms so each university will have a **SHARED** understanding of terms, functions, etc. This shared system will consist of a common definition of services. For example, students should be able to enroll in any course at any of the three schools; information regarding the courses will be offered by one central system and there will be a common course name and number that can easily be identified.

- A centralized system must be established to maintain interoperability

- The IT infrastructure must provide a multi-Gigabyte network infrastructure linking the campuses, common security mechanisms, and other networking applications and technologies to insure a standards-based, robust, readily available network to support the teaching and research missions of the three universities.

- While each distinct university should maintain and support a robust networking and telecommunications infrastructure that is responsive to its mission, these infrastructures should be integrated and inter-connected. Integrating network infrastructures will encourage system-wide collaboration making it possible to conduct teaching and research in parallel at distant locations. System-wide fiscal efficiencies will also be achieved through real-time sharing of expensive scientific instruments such as remote scanning electron microscopes, stellar observatories, and MRIs over a high-speed integrated network.

In provisioning information technology resources and services, the University System should leverage existing resources and services within the state, such as NJEDge.Net (which, for example, can allow sharing of the statewide bandwidth), as well as the existing resources at each institution.

- While each distinct university will require dedicated IT systems and a support organization that is responsive to its mission and local needs, at the System level there should be some structure or mechanism that: coordinates a university-wide IT culture, oversees the integration of resources and services system-wide, and provides short and long range strategic planning for the System.

- System-wide initiatives should be developed to provide and support some of the advanced networking resources that are rapidly creating new collaborative research paradigms. System-wide investment in these next generation capabilities, for example, highly interactive "collaborative environments," "virtual laboratories," or "collaboratories," will not only serve to develop and enhance statewide research collaboration but will provide enabling infrastructure for New Jersey's researchers to nationally participate in collaborations with the international research community.

- Given New Jersey's recognition of the pharmaceutical, biotechnology, and medical devices industries as high growth areas, system-wide initiatives should be developed to build capacity within the New University for using quality distance education to facilitate the rapid retooling of the existing professional workforce.

- The System should undertake efforts to identify and develop information technologies that will serve as enabling infrastructure to foster and facilitate research and development partnerships and education partnerships with industry with the goal of promoting New Jersey economic prosperity.

Health/Hospital IT/Library Systems

The health school **clinical** systems must remain separate for security purposes (e.g. HIPPA regulations).

Cost Estimates

The committee is unable to provide a cost. Once the strategies, assets, and needs of the new universities are defined, it will be easier to estimate costs. In general, we suggest the state provide each school with the necessary resources to meet its goals.

CAVEAT

The members thought it was very important to note that the restructuring project should not be rushed. Past research has shown that rushed mergers and acquisitions tend to fail.

University of the North: IT/Library Task Team
(Proposed Restructuring of New Jersey's Public Research Universities)

September 10th, 2003

The Task Team for University-Level IT/Library Services Planning for the North is pleased to present a summary of its deliberation. The dialogue follows the order of the deliverables in the formal charge presented to us.

The task team members are:

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Peter Teklinski, NJIT IT

1. Institutional assets of the University/Future needs that require supporting technology/library Services

A. Assets

The proposed single research university in Newark, based on the array of evolving inter-institutional relationships between and among NJIT, Rutgers-Newark, and UMDNJ, and with their multiple constituencies, partnerships, and programs, both local and national, would bring much strength to the aspirations toward the highest level of academic and research excellence. Some of these existing strengths that could be brought to the development of a major research university in Newark are as follows:

- **Academic and research strength** in the **health sciences (**life sciences, clinical medicine, dentistry, health-related professions, nursing**); sciences** (biosciences, neuroscience, psychology; chemistry, physics, mathematics, earth and environmental sciences, computing sciences, information technologies); **professional areas** (engineering, architecture, criminal justice, law; business/management; public administration); and in the **liberal arts** (social sciences, humanities). There are or will be new **interdisciplinary research centers** in areas such as **molecular and behavioral neuroscience; cellular dynamics**; **applied life sciences/bioengineering; information and communication technologies; materials engineering**; as well as in the social science/policy research areas of **global governance and change**; **metropolitan studies; urban education; crime prevention; terrorism and homeland security,** among many others. There are also **interdisciplinary institutes** in areas such as ethnicity, culture and the modern experience; **education law and policy.** There is an increasingly prevalent arts presence. Clearly, there is strong **faculty expertise and significant undergraduate and graduate engagement** in these and related areas.

- There is **UMDNJ University Hospita**l, a singularly unique facility within the system, owned and operated by the medical school. University Hospital, their affiliates and faculty practice comprise a vast clinical enterprise providing primary health care for the Newark area and tertiary care for a much wider region with state-of-the-art health care in **oncology, neurosciences, opthalmology, heart disease, infectious diseases, child health, genetics, and geriatrics** where research results are translated into practice. UH is the home of New Jersey's only **Level 1 Trauma Center**.

  There is **University Behavioral Health Care**, providing **in- and outpatient mental health and addition services** at more than 35 locations around the state,

- There are local and international **distance learning degrees and programs** in place, many of them longstanding (particularly at NJIT) and there are many **e-learning initiatives and training programs.**

- There is an internationally renowned **research collection in jazz,** which is leading a major **digital initiative.**

- There is a history of **collaboration**, with an array of **joint programs, cross-registrations, and federated departments**, and a **Graduate Center** at Newark that encourages **shared research** and capitalizes on combined resources of the three institutions. There are **collaborative research programs** in place. Most of the academic and administrative service areas have a history of providing resources and services (at some level) in support of students and faculty from the other institutions that participate in these programs.

  There is a strong **urban mission**, with the three institutions playing a **leadership role in many local and regional programs and consortia,** ranging from the Regional Business Partnership, to University Heights Science Park and its new **Science Park High School,** to the **Council for Higher Education in Newark (CHEN).** Science High, a **Magnet High School** will open shortly and offer unparalleled opportunities for Newark's gifted students to participate in University-level research programs.
- The three institutions have long been involved in the development of the city of Newark and participate in citywide planning. Faculty have increasingly conducted research on the city, and students in many programs undertake local **experiential learning**.

- There is a **diverse student body** (with national recognition), with a growing residential student population.

- There are significant **outreach programs** in place at all of the colleges and schools, many with the **Newark Public Schools**, there are **legal clinics** that provide legal services and educational programs for the local community; there are community **health-care clinics and programs;** there are **safer cities** and police scholars programs. There are strong **academic support and pre-college programs.** There are

professional/training programs, including in the information technologies area, offered to many communities.

- There have been significant **improvements in the physical facilities** that range from new facilities (e.g., in law, architecture), to greatly improved **wired and wireless connectivity**, to "**smart" classrooms** and other **e-learning spaces.** NJIT has gained national recognition as a **"wired" campus**.

- There are strong **partnership**s and relationships with the **cultural and educational organizations** in Newark (e.g., **Newark Public Library, the Newark Museum**, the **New Jersey Historical Society,** the **New Jersey Performing Arts Center),** with local hospitals and health care agencies, research institutes (the **Public Health Research Institute)**, schools and colleges, business organizations, government agencies, communications/broadcasting organizations, and the like.

- There are corporate and governmental partnerships. The neighboring **University Heights Science Park** offers an array of additional partnerships and possibilities with its resident corporate community. Science Park is also the new home for the **International Center for Public Health** housing the **Public Health Research Institute,** the **National Tuberculosis Center** and the medical school's **Department of Microbiology**.

- There are and will continue to be programmatic **inter-relationships and collaborative research** with the **two other geographically-based universities** in the Central and South, with students taking courses, faculty teaching, and researchers sharing resources and programmatic activities.

- There is considerable change in the **city of Newark** as it undergoes a major r**enaissance**, with the university (existing three institutions) contributing to this change. There is a growing workforce population with information technology skills.

B. Requirements for technologies/library services support

Implicit in the forgoing discussion and applicable to the delivery of any electronically mediated content regardless of it's source is the provisioning and maintenance of scalable, extensible, manageable and available technology core capable of supporting the needs of a very large and extremely diverse environment. When considering the assets described in the introductory section, a rationale mapping emerges between the "asset" and the generalized or high-level IT "resource" needed for its support.

Clearly, the information technology/library organizational units of the existing three universities in Newark have contributed substantially to development of these institutional assets. They have, with appropriate backup support from others in their organizations and elsewhere in the universities, built an advanced technical infrastructure supporting a broad spectrum of networked resources including specialized and high performance computing, implemented complex administrative

applications, extended connectivity to some of the partner institutions in Newark, managed email, licensed software, developed and operated student computing labs, administered security systems, provided support for web initiatives, and the like. University Hospital has built a sophisticated clinical information environment comprising integrated record and document management, fully interfaced ancillary systems and state-of the-art digital radiography. The respective libraries have, of course, provided access to information in all formats and have been active in physical and digital reference, reserve, document delivery, information literacy instruction, web-based resource guide development, exhibition coordination, preservation, use of other libraries and information centers, and the like. The libraries have served as sites for computing labs and have provided assistance in support of e-learning.

The need now is to build on this history of service in support of campus mission and constituencies and provide the highest possible support for the single research university in the Newark environment. There are some distinctions that the information technology/library systems in this area may have to address. Some of these are as follows:

- The Research University is situated in the greater metropolitan NYC area, a region of intense competition academically, commercially and clinically. The University's IT infrastructure is a key factor in maintaining the level prominence that that attracts and supports economic development, research incubators and world-class centers and institutes.

- University Hospital and its faculty practices will continue to depend on 7x24x365 availability of its IT resources and fail safe disaster recovery procedures along with a staff of highly trained analysts, programmers, project managers and technologists to support its complex health care information management applications. An expanding health care community will have to continue to be served with the highest standards of practice and technologies

- The concentration of higher education institutions and their wide variety of programs augers for integrated administrative systems with broad decision support capabilities both locally and system-wide. Access to information must be straight-forward for faculty, administration and students. Students must be able to move freely between campus locations and have immediate and uniform access to the personal and scholarly information and services required for their academic studies and research.

- The academic strengths – the sciences (pure and applied), technologies, health areas, and the professional schools – will all require a tremendous array of resource support in multiple disciplines, including those in the liberal arts. This support may well be largely digital, but will also require print materials.

- The liberal arts areas will, clearly, require strong information support in all formats.

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- Areas such as health/biomedical/biotechnical informatics will be crucial to effective research support

- The technological/corporate partnerships in place or under planning will have to be served in the most appropriate way. This also holds for the institutions connected to the University Heights Science Park.
- The distance learning initiatives will have to have strong information/library support – content development. Educational outreach will extend nationally and internationally describing a need for reliable global support systems including course managers, administrative and financial systems.

- There will have to be strong information literacy/management instructional programs, supported with on-line tutorials and educational programs, that reach out to the K-12 community, as well as (of course) to undergraduate and graduate students. This may well turn out to be a major initiative.

- Support of diversity in ethnicity, educational background and concentration, community orientation, and businesses will require on-line, easily accessible and uniquely designed tutoring and remedial courseware development, delivery platforms and designers with broad experience.

- The new learning management systems lend themselves to making adjustments for differing learning styles and knowledge bases, and work will have to be done developing/employing/assisting with the use of /and assessing these new systems. The new systems that allow for the identification and manipulation of "educational/e-learning objects" will facilitate the re-use of educational material and prove of great value to students and course developers alike.

- The work that has begun building a high quality digital library in jazz - audio, video, text - will have to continue. There undoubtedly will be other significant collection areas in the new university that will need to be developed as digital libraries.

- The Newark institution's history of collaboration among themselves and with the community demands technologies to support advanced and secure resource sharing and electronic collaboration. There have been numerous cooperative and collaborative programs in existence, some for many years – mutual borrowing and lending through CHEN, coordinated resource development and management, (including coordinating journal cancellations). The several libraries have been involved in accreditation visits of the academic programs that are jointly supported. Under the auspices of VALE (Virtual Academic Library Environment), there have been other coordinated resource and service programs.

- The network infrastructure, wired and wireless, needs to support the work not only being undertaken on the physical campuses, but also under the auspices of the many other educational, cultural, business, governmental, and health agencies in Newark and the region with which there are partnerships and joint programs. Connectivity

to and for these longstanding and new partners will be essential, as will assistance in content development and usage.

- The law (and criminal justice) library will need to interface effectively with the other libraries.

- Other libraries in Newark and the region will to interface with the university library system so that there is maximal use of all resources.

- University partners – at the Newark Museum, the Newark Public Library, the New Jersey Historical Society, NJPAC, and at other organizations and agencies – will have to be appropriately integrated into the system of users. Essex County College, a member of CHEN, will also have to be part of the system of users.

The single urban research university will have to incorporate these and many other entities into its "footprint" of service. Like the other universities, there will have to be research and development centers in the respective library facilities that will facilitate experimentation in the diverse aspects of the digital environment – digital library development, informatics, geographical information systems, and the like.

2. Vision with principles that should guide design, delivery, scope of IT/Library Services

Proposed visions for a research university library system that builds on existing research library and disciplinary strengths and system-wide long-term cultivated inter-dependencies and that addresses the need for the strongest possible information resource support for the three geographically separate research universities is a critical challenge. Some of the discussions among librarians predate our deliberations. A consensus on a model could not be achieved. These visions, "integrated" and "federated," are presented as appendices I and II. A federated vision for core IT is substantially congruent with the vision presented below.

A Vision for the IT Environment of the Research University

Restructuring of New Jersey's public educational institutions provides the opportunity for a geographical concentration of academic/research/outreach activities and expansion of these endeavors already in place; it also takes full advantage of the physical resources, diversity, broad intellectual capital and commitment to advanced education, research and community service and development already vested in the North. IT support for the North University must be designed to support and enhance these activities while reaching the end goal of top tier university status. A vision that recognizes and sustains our many strengths and commitments while fostering the level of growth that positions us to compete successfully with our peers requires that a number of guiding principals and characteristics for excellence be established.

The location of the North University sets it among some of the top businesses, educational institutions, and attractions of the world. This location has significant advantages for the North University to expand on existing programs of collaborative

research and instructional programs; it creates challenges and opportunities for research in the special needs of the urban educational and living environment; and it requires that the North University implement technology systems that enable it to compete in this environment.

Beyond this geographic focus, international programs will require high-quality equipment that reliably transmits educational content and allows for electronic collaborations between and among a variety of academic and business partners.

Overall management of the campus infrastructure is beyond the scope of this document. However, the current location of data centers and their application focus suggests a combination of local and campus wide management. Over time, similar facilities would be combined for ease of management and scalability. Similar logic would apply to the overall campus network, with more localized control within building or clusters of buildings and centralized management governing the wider view.

At the system level, a minimum of global standards will be crafted that provides for interoperability or sharing of information promoting and allowing mobility of faculty and students between University campuses. Examples of such system-wide standards might be central identity management and authentication, naming conventions, etc. At the University level, IT services will be reengineered to support the unique missions and educational endeavors of the campus. These campus systems will provide a full array of IT services that operate independently but interface across the system as necessary to support the broader needs of inter-campus information sharing.

NJEDge.Net would be envisioned for system-wide transport for data and video and would be looked upon to provide a high performance video conferencing portal, I2 connectivity, security services other shareable services that might be required by the Universities and effectively delivered by a system-wide provider.

Research programs require technologies that support and enable collaboration, analysis, and sharing of information. Utilization of research programs in the instructional environment requires classrooms with high-speed networks, fully equipped with presentation technology, and instructional devices. Enabling faculty to integrate current research into instructional courseware requires adequate IT support by discipline specific specialists.
While considerations such as these are difficult to reduce to a few lines, the committee believes that when the planning is complete the result should be the advancement of academic culture that celebrates diversity and continues to invest in the opportunities the Northern region offers through attunement to a unique mission and appropriate consideration to system-wide synergies.

3. Recommendation for intercampus and system-wide synergies

A considered balance in the deployment of resources on a campus, between campuses of a University and across the Research University System is key to effectiveness utilization and sound financial management. Detailed decision must await the next phase of

planning, but certain higher-level principles can be articulated. The institutions of the proposed North University have embraced technologies that are both effective and key to their individual missions. Coordination of resources and management thereof must necessarily preserve and enhance assets already available. At the same time the whole must greatly exceed the sum of its components if the North is going to continually move further into the top tier of research universities. The essence of our considerations is outlined below:

- System wide shared standards should be established to guide the 3 universities in their development of their IT systems.
    - Standards for WAN handoffs to NJEDge
    - Data warehousing and mining use to provide combined data sharing
- Portions of the IT systems may be centrally managed to support all 3 universities (north, central, south). Examples include:
    - Identify management
        - Common database for all users within the state system
        - Used to support access to system wide resources such as
            - library access
            - cross-registration
            - super computing facilities
            - parking systems
            - building access/public safety
        - Could be facilitated by LDAP system redundantly configured in North, Central and South
        - Data fed from North, Central and South's system using common standards.
        - Could be facilitated with an organization such as NJEDge
    - Super-computing
        - Greater economy of scale if shared among all three universities
        - Common facility
- Remaining IT systems may (or must) be locally managed by each of the 3 universities to enable the universities to be responsive to local needs and cultures. Examples include:
    - Health /hospital information systems
    - Portals
    - Administrative systems such as
        - HR
        - Registration
        - Alumni/development
        - Finance
    - Telecommunications and networking within the North University
    - Local authentication/file systems
        - MS windows domain(s) / active directory (scaling issues apply)
        - Centralized file management within the North University

4. A. Recommendations of IT initiatives/milestones to achieve top tier status

IT services and resources supporting a top tier status for the university will require a significant investment of funding to analyze, acquire, implement, and expand the services as they now exist on the North University.

Assure the continuing technological prominence of University Hospital

University Hospital's unique mission within the Research University System and it's critical role in primary healthcare for Newark is intimately tied to state-of-the-art IT implementation and management.

Milestones include: Successful completion and growth major applications including EMR, document management, digital radiography and continuous upgrade and replacement of existing ancillary systems.
Recognition of UH as a flagship for a broad spectrum of health registries, drug interaction, poison control and other electronically-mediated interventions.
Demonstrated leadership for IT in the maintenance of HIPAA and other regulatory compliance.
Implementation of new applications and technologies that enhance educational, clinical and financial outcomes.

Increase use of technology in the classroom

Technology provides the conduit through which instructors bring a rich and varied set of instructional resources to the classroom. Students now expect that instructors will use technology in their presentations; and they expect that they will use technology for their outside of course study and preparation. An appropriate number of classrooms must be equipped with hand-on technology resources and all classrooms must have access to network connections for use by the instructor. Computing stations must be available for students during their out of class hours.

Milestones include: Expansion of computer teaching classrooms
Expansion of networked classrooms
Expansion of computing stations

Prepare students for using a variety of technologies in use in the field

Technologies are changing rapidly requiring a continual recycling and replacement of technologies for instruction. Students must be prepared to use and manipulate the latest technologies.

Milestones include: Expansion of classroom technologies to state-of-the-art modes

Implement University-level support systems

Daily administrative operations and inquiries should be supported and enhanced by a set of enterprise systems spanning the University campus. In many cases, business processes may need to be reengineered or defined and applications will need to be obtained.

Milestones include: Implementation of integrated intra-campus (North) administrative, financial and student information systems.
Implementation of intra-campus learning management system
Implement connectivity to student course materials throughout the institution
Design and implementation of a model for end-user desktop support including service center/help desk support for voice, data and video add/move/change, help function and service dispatch

Establish a staff support structure modeled on best practices

The provision of a full support team will allow faculty, researchers, staff, and students to focus on their primary activities. A team of technology trainers with expertise in specific technologies and instructional disciplines will be available for consultation and development of materials that aid in the instructional process.

Milestones include: Defining an organizational support structure that considers academic, research, healthcare, instructional and media services and their attendant technical and client support requirements.
Acquiring technology experts, discipline specialists and skilled support staff.

Develop a metropolitan area network design to provide high bandwidth connectivity among the campuses of the North Research University and their partners.

The network is, of course, the lifeblood and heartbeat of the University. Each institution has developed advanced network capability which must now be integrated such that the "enterprise" is not only more capable than it's components, but respects a level of autonomy that respects existing programs and mandated requirements for security and privacy.

Milestones include: Developing physical network architecture
Developing management model policies that delineate intercampus and local management oversight.
Provisioning of circuits and end-point hardware.
Network deployment
Students, faculty and staff move freely through university locations maintaining a uniform view of and access to their electronic resources.

Develop a plan for the enhancement and management of very high performance research computing and storage management facilities for the North University

Very high performance computing is essential for the success of the University. Success will be predicated on achieving a balance between institutional, University and system-wide resource.

Milestones include: Identifying research programs employing or planning for high performance computing

Preparation of inventory of existing high performance hardware applications
Collaboration with the system Universities to develop shared extreme performance facilities for the system-wide enterprise and attendant policies for their fair and effective utilization for very large scale and "grand challenge" problems.

4B. Recommendation of initiatives and/or milestones necessary for Library services to properly support each University's goal of achieving "top tier" status.

To support properly the university's goal of achieving "top tier" status, the libraries must have financial resources commensurate with those of the top ranked research libraries. These resources are needed to acquire substantial scholarly resources, develop a robust digital infrastructure, and provide the required suite of supporting services. Research libraries in North America are measured and ranked by the Association of Research Libraries (ARL). The recommended goal is to achieve a rank within the top fifteen of ARL members over a period of five years. This goal applies to each university if the libraries are separated by region.

At the conclusion of the five-year period, the minimum financial resources and the staff complement required at each university to achieve top status, excepting medical libraries, will be:

Library Materials Expenditures	$16,700,000
Operating Expenditures	$6,850,000
Total Library Expenditures	$40,500,000
Staff*	466

*Staff numbers will need to be increased for a multi-campus structure.

Currently, there are no specific indices that rank academic health sciences libraries that is comparable to those of the Association of Research Libraries (ARL). The most authoritative resource for measuring the assets of academic health sciences libraries, 2001-2002 Annual Statistics of Medical School Libraries in the United States and Canada, 25th ed., provides comparative data on significant characteristics of collections, expenditures, personnel, and services in medical school libraries.

Therefore, in order to construct a comparable model and table that applies to each university if the public research university libraries are separated by region, each university would need to support its own academic health sciences library at the appropriate level to enable competitive collaboration.

The figures below show that at the conclusion of the five-year period, the minimum financial resources and the staff complement required at each university to maintain competitive status among medical libraries will be:

Library Materials Expenditures	$2,904,863
Operating Expenditures	$387,223
Total Library Expenditures	$5,953,060
Staff*	41

Other specific needs for which extraordinary funding will be required include:

• Development of a single library information system. Interim operations can be supported via Z39.50 and scripting or third party software, and the move to a single system can be staged, as legacy systems require replacement.

• Shared electronic resources across the research university system. Resources not previously available to all institutions will need to have their licenses expanded.

• Prompt physical delivery among libraries and universities. No university location will have all materials needed by its community.

• Evaluation of physical buildings for consolidated services. Consolidation might provide opportunities for recouping space for collections or public use.

• Extension of memberships and cooperative access arrangements previously held by one institution to all libraries will broaden opportunities for all students, faculty, and staff.

• Overall equipment and software compatibility will be necessary for effective delivery of services to the desktop and for users of multiple libraries across the research university system.

• Video conferencing equipment for shared services and operations will enable efficient and effective use of personnel time as well as opportunities for professional development

Appendix I: An Integrated Library System

Vision for a Research University Library System

The proposed restructuring of New Jersey's public research universities presents significant opportunities for the libraries of NJIT, Rutgers (university, law, and affiliated libraries), and UMDNJ to provide expanded and seamless information access for all faculty and students across the new public research university system, gain broader staff expertise to develop more innovative services for users, and have the capacity to secure additional external support to enhance all operations. The new model envisioned would provide the necessary infrastructure for the three institutions to be competitive in securing the best faculty, students, and research grants, and have access to one of the best research library systems in the country.

We are taking a bold approach toward re-envisioning the research library environment in New Jersey. Our vision goes beyond current capabilities and collaborations to envision a model of seamless research, academic, and clinical support at every stage of the scholarly and instructional processes, as well as in the area of direct patient care. The integration of the resources of the NJIT, Rutgers, and UMDNJ libraries into a re-structured system across three universities will provide unique opportunities for the development of integrated resources and services. The NSF cyberinfrastructure program characterizes well the infrastructure needed for the advancement of scientific and engineering research based on the unique opportunities of information technology. Similarly, the goals ad objectives outlined in the mission of the National Institutes of Health and the National Library of Medicine's strategic plan address current and prospective needs for biomedical research and patient care. These priorities highlight both the common and unique needs of the biomedical community.

Both the NSF and NLM programs posit a larger role for research libraries that radically alters the relationship of libraries, scholars, and publishers by building a new platform for scholarly discourse. In order for the public research university system of New Jersey to play in this new arena, it needs an outstanding research library system capable of responding to future needs. The integration of existing and anticipated resources available throughout the libraries will provide the infrastructure and depth of coverage necessary to meet the needs of biomedical, scientific, and engineering researchers, teachers, and practitioners. Only an integrated research university library system provides the right opportunity for this to happen by avoiding unnecessary redundancies, and directing as many tangible resources as possible to acquiring and developing collection resources, creating and offering exemplary library services, and to expanding external support.

Our vision of an integrated research university library system will provide the following for faculty and students:

- A research repository of the intellectual assets of **the three** universities created and sustained to support local, national, and international collaborations

- Access to subject/discipline and program specialists **within the Libraries** for information consultation and collaborative work, such as the creation of digital instructional support materials

- An information technology infrastructure with access to content in all formats to facilitate cross disciplinary research (for example, medicine and law, pharmacy and business, liberal arts and sciences)

- A comprehensive range of electronic databases linking citations to full-text information and ubiquitously available to everyone affiliated with the university, regardless of location. **Appropriate access policies will be developed for university partners, including those individuals at other cultural/educational organizations and in the corporate sector.**

- Print resources developed according to institutional mission but shared seamlessly across the research university system

- Desktop delivery of print ad electronic resources to offices, other libraries, and remotely to off campus students and faculty **and, as appropriate, to University partners**.

- A unified online catalog for seamless identification of and access to information resources

- Online borrowing and delivery of library materials from all libraries by all users of the research university system

- Access to national and international collections through resource sharing agreements negotiated for the library system (Center for Research Libraries, NERL, NN/LM, OCLC, PALCI, Research Libraries Group, etc.)

- Online reference service 24 x 7

- Creation of and access to digital resources for teaching and research

This new model is based on the understanding that:

- It responds best to the views and concerns expressed by the Commission for change and improvements that are real

- It builds on collective library strengths that currently exist at NJIT, Rutgers, and UMDNJ.

- It is **better** aligned to coordinate collection development and library service policies, and thus offers a robust and sustainable policy framework

- It can maximize resources over the long term, take advantage of economies of scale, and ensure continuous improvement in the efficiency and effectiveness of the New Jersey research university library system

- It strengthens and expands personnel expertise and information management capabilities through coordinated recruitment and professional development programs

- It enhances each university's competitiveness by responding to distinct regional needs and services, while benefiting from the strengths and economies of an integrated system

- It presents greater fiscal flexibility to direct funding to strategic strengths, enhances system-wide infrastructure, and ensures accountability to each campus

It is part of the RUL Vision statement. It is important to our understanding of what a research library is and how it functions. We do not want to give our faculty and students less than what they have at this time, and need to build on what we have already put in place. We believe that as a university and as a library system we are poised to do this - to put in place a significant and strong integrated library system that will assist the university in moving toward the achievement of its aspirations. Newark needs to be a full part of this kind of strong, cohesive, and integrated library system or we will be putting our constituencies at a major disadvantage.

The new vision for the public research library system cannot be realized through a consortial model where participation if "purchased" and collaboration is voluntary. The research library of the future is not a composite of commercial products and services that are acquired. The outstanding research libraries of the future are being built now on a continuum of technology enhancements based on open systems and standards that mandate coordination and interdependency to succeed. The capacity to build the library of the future requires an investment in individuals who have the expertise to design and develop a seamless construct of services and resources that are easily discovered and used in context; that can be pulled into course management systems; that can be modeled for varying disciplinary need - from architecture to the human genome; that can be migrated to new systems and preserved in perpetuity. The substantial and

sustained financial commitment to support such developments to create this outstanding research library system will be significant, both for physical resources as well as for human resources.
A new paradigm for library support requiring the training and re-deployment of staff into new areas across the system to support to implement the vision will be required. This would not be possible with the managerial oversight costs of a consortial model. The justification for redundancies required by separate autonomous libraries and the impact of independent decision making will not only unnecessarily complicate the development of a superior system, but limit the impact of the financial resources already available for building a truly sophisticated system and set us back many years at a time when we need to move forward aggressively. Unlike California, New Jersey has two major factors that facilitate the development of an integrated public research library environment: compact geography and two institutions with a well functioning system-wide model in place: Rutgers and UMDNJ. We need to build on rather than de-construct and duplicate what we already have, capitalize on the synergies made possible by the small distance among the three universities, and maximize the value of interdependence.

The reporting structure and details of the model will be worked on later. There are many ways that this model can be achieved; for example, the business model assumptions for the new university system notes that "the Presidents and their faculty and staff will also be called upon to provide system-wide services in a collaborative model." Whatever reporting structure is selected, the libraries need to be closely associated with the research and academic programs they will support.

The **principles embedded in the above Vision statement build on the existing strengths** of the three libraries – the two **multicampus systems of Rutgers and UMDNJ** and the Newark-based NJIT library - in terms of collections, staff, and service systems, integrating them all **into a single research library system that will be further strengthened and enhanced to meet the advanced information needs** of a significant research university. In this way, all three geographically-based campuses will have the full benefits of being part of a major research library – rich electronic and print resources, access agreements made available by and through the research library community, considerable staff expertise, coordinated research facilities, and multiple research grant opportunities. A basic premise is that **no campus will receive less information support than it has at the present time –** the overall idea is to provide more resources, building on what we have at the present time, toward the effective support of expanded research, instruction, and outreach. In terms of economies and the maximal use of resources, a single strong research library system makes sense as a way to provide effective support to the university's multiple constituencies – from the senior biotechnical or neuroscience researcher to the local elementary school student, to keep up with and contribute to the conceptualization and development of digital libraries and the new kinds of services that will be provided by libraries, and to play a leadership role in the national grants community and on the campuses.

Together, the librarians and staff of the (erstwhile) respective institutions **can share their expertise – in intellectual property, digital rights management, digital library**

development, metadata, digital video and other media, learning technologies systems, e-learning, data management, geographical information systems, effective videoconferencing, and the many other emerging areas that will be of critical interest to researchers, students, and the multiple publics that the university will serve. New kinds of collaborative and interdisciplinary research can be fully supported through the **joint development and management of high-quality digital library and institutional repository development and access arrangements**. Instructional and outreach programs can be supported through electronic and other information resources and **information literacy/management initiatives** in areas ranging from **bio/medical informatics to web-based visuals and learning management systems.** The library as a conceptual entity is, clearly, changing, and as it re-creates itself in the digital arena we believe that it can play a major role in the provision of services in support of the new technology-based pedagogies, including providing content for some of the new learning management systems.

At the same time, full **attention can be directed to needs** generated by individual university missions, campus areas of excellence, and/or other requirements, and partnership and outreach initiatives at diverse levels can be addressed. This can be accomplished - as it is now, but in an even stronger way - **through accountability and evaluation systems, through full participation in decision-making, and through effective liaison arrangements.**

Intercampus and system-wide synergies and commonalities appropriate for future planning

The above Vision statement is built on the integration of system-wide synergies and commonalities into its formulation. This is so because **two of the three institutions –** Rutgers and UMDNJ **– are system-wide in mission and organizational structure**, resulting in many years of successful experience developing and implementing programs of coordinated interdependencies. There has long been coordination of collections, service programming, technical services and systems support, and facilities and equipment management in a way that provides the resources of the whole system in support of local needs. Within each of the two systems, there has been a full sharing of resources that has been particularly beneficial to the Newark and Camden campuses. The challenge at hand is to integrate the resources of the three institutions, located on the three geographical campuses, in a way that is respectful of each institution and the programs and partnerships it has developed over the years. In this way, the new integrated system can provide the strongest possible support to the new research university. We believe that this can be done through focusing on **interoperability, resource-sharing, equipment and facilities compatibility, and the sharing of expertise.** This will require the following:

- Development of a single library information management system that interfaces effectively with administrative systems (for personnel, registration, purchasing, business, and the like) in use or under planning at the three universities. Attention will have to be directed at the most appropriate way to integrate or to interface with the information systems used by the law school libraries in Newark and Camden.

- Sharing of electronic resources across the research university – the three geographical
  campuses and the multiple facilities on each campus. Authentication and authorization systems will manage access to information by the many partners that participate in university initiatives

- Prompt physical delivery throughout the respective library facilities

- Sharing of expertise so that all campuses have full access

- Extension of memberships and cooperative access arrangements

- Overall equipment and software compatibility and upgrade

- Videoconferencing equipment used in support of shared services, operations, and training

- Coordinated facilities in place on all campuses for research and development/experimentation with new technologies

Appendix II: A Federated Approach to Library Services

Vision for UNJ-Newark and UNJ-system Federated IT and Library Services

Vision:

> The UNJ-North library and IT services will operate in a semi-autonomous mode, within a federated architecture. The federated model, like the architecture of the Internet, with each domain owning and deciding for itself what information to provide and how to provide it, ensures that no one institution dictates decisions. The federated model ensures a high degree of cooperation, collaboration, and responsiveness.
>
> Federated systems are the organizational architecture behind rapid business-to-business prototyping, self-organizing systems, fast-track development, open-source software, and peer-to-peer systems. They are the future of both technology and organizational developments.

This vision uniquely responds to the Governor's Review, Planning, and Implementation Steering Committee's vision and charge:

> "*Each university will operate in a semi-autonomous mode within an overarching system framework*."
>
> "*Create a high-level model of how technology and library services could be delivered to fulfill the opportunities presented by this restructuring*."

Our vision is a less bureaucratic, more responsive and innovative, "bottom-up" model, rather than a "top-down" one.

Since "*Each of the three universities will be expected to have a distinct mission and educational niche … and geographical concentration,*" this federated model offers the best and most efficient method to ensure responsiveness to the local mission. And, if the UNJ framework is to truly be one of "cooperative competition" between the three newly-configured research universitie entities, then, clearly, this Federated vision is the one that will best fullfill the opportunities of the restructuring and support each university's goal of achieving top tier status.

Two-part Federated Model:

1. Independent, considerably autonomous, UNJ-Newark library and IT services (Task Force: *"While each university and its president will be provided 'the authority and considerable autonomy to be entrepreneurial leaders' so as to 'enable each institution to realize its full potential' …")*

1. Resources (especially physical resources such as people, books and collections, buildings, facilities, equipment, etc.) will be available locally at the point of need.
2. Customized user services will be developed to meet the unique institutional needs and mission of UNJ-Newark (e.g., specialized staff, equipment, information resources would be necessary to achieve probable science, technology, and medical niche envisioned for UNJ-Newark).
3. A 10-year goal is for the UNJ-Newark library to become a member of the Association of Research Libraries (ARL designation for the top 120 + libraries in the country; in 2002 dollars, this will cost approximately $20 million per year; similar to UC-San Diego). Georgia, with a population similar to NJ, has two public research universities with ARL libraries. California has seven; NY has four. NJ should have at least two public research universities with ARL libraries.
4. Funding for library and IT services will be locally allocated to ensure that such services and decisions are best addressed where the decision makers (e.g. technical staff, librarians, other staff, etc.) are closest to the students and faculty being served.

2. UNJ Library and IT Federation (Task Force: *"… the institutions will also act in 'cooperation and collaboration … so as to … minimize duplication and increase efficiency and effectiveness'")*

1. The Federation will be monitored by the chancellor's office; governed by representatives from each of the three NJ public research universities (South, Central, North); and advised by representative from other appropriate local, state, regional, and national groups.
2. The Federation will work on interoperability, seamless user access, standards, cooperative purchasing, promoting best practices, etc.
3. The Federation will work together to harness resources collectively to accomplish services and resources that could not be accomplished independently (e.g., developing and sharing courseware and systems (e.g., MIT OpenCourseware project), 24x7 specialized digital reference, digital institutional repositories, resource sharing agreements, reciprocal borrowing privileges, sharing network resources, etc.).
4. The Federation will create N-DAL (New Jersey Digital Academic Library) independent of any particular university. N-DAL will be modeled on the California Digital Library and the Florida Center for Library Automation. N-DAL will be charged with advancing scholarship and research, fostering excellence in teaching and learning, and promoting service to the public through (a) developing and providing continuous access to high quality digital content and services, and (b) facilitating and supporting innovations in scholarly communication in all eligible NJ institutions of higher education.
5. The federation will work with other federated state, regional, and national groups (e.g., VALE, ARL, EDUCAUSE, NJEDGE.net, PALINET, state library, other NJ state colleges and universities, NJ community college system, etc.).
6. Funding to the Federation will be both direct from the chancellor's office and by contract from the federation member libraries and other participants.

New Jersey System of Public Research Universities
System Planning Project
Vision for Central University IT and Library Services

IT and Library Issues Working Group: Central University
September 10, 2003

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New Jersey System of Public Research Universities
System Planning Project
Vision for Central University IT and Library Services

This team has been asked to produce a vision and implementation model for the Library and IT services needed by the proposed Central University.

The overall goal of the reorganization is to produce three semi-autonomous universities, each of which is a world-class research institution. This document looks at ways in which the Library and IT should be organized to support this goal.

The Library and IT are both essential elements of any major university. The Rutgers libraries currently have a goal of moving into the top 15 ARL libraries. The UMDNJ libraries have a similar goal. These goals are most reasonably achievable if there is a single library system. Thus this report proposes a library structure combining the existing Rutgers and UMDNJ libraries into a single system serving the needs of all three of the new institutions. One campus-specific requirement is creation of a New Brunswick medical library.

We will also need a leading-edge IT organization. In the IT area we believe the appropriate model is one of federation. Each of the universities will have IT organizations providing a full set of services to the university. In addition, there will be a coordinated approach to key middleware services such as directories and authentication, which facilitate building services that are available to the entire system. This federated approach is the core of next-generation software being developed by the Internet 2 community. A similar approach will be used for the network. Each university will have a network with its own internal routing. These networks will be connected using technology designed for inter-institutional communications.

There are special considerations for health-related and clinical systems. These systems have particular requirements for security, privacy, and reliability. Thus we propose having a dedicated IT organization as part of the health affairs area, but taking maximum advantage of services in the central IT organization and elsewhere.

Administrative systems support both academic and administrative activities. These systems require special attention. The process of reorganization will require new applications in some areas and reconfiguration of applications in others. In all areas, operating practices and existing data from Rutgers and UMDNJ will need to be examined carefully. If we are to avoid duplicate systems, processes in one or both organizations will need to be adjusted, and data – including historical data – will need to be mapped into the new structures.

In addition to campus administrative processes, a structure will be needed to combine data for all three universities in a consistent form, in order to enable system-wide reporting and planning.

Library Services

Vision

The proposed restructuring of New Jersey's public research universities presents significant opportunities for the libraries of NJIT, Rutgers (university, law, and affiliated libraries), and UMDNJ to provide expanded and seamless information access for all faculty and students across the new public research university system. Our vision for library services is the creation of an integrated research university library system. The system will build the existing resources of the NJIT, Rutgers, and UMDNJ libraries into a re-structured system across three universities that will provide seamless research, academic, and clinical support at every stage of the scholarly and instructional processes, as well as in the area of direct patient care.

Our vision of the integrated research university library system provides the following for faculty and students:

- A research repository of the intellectual assets of the three universities created and sustained to support local, national, and international collaborations
- Access to subject/discipline and program specialists within the libraries for information consultation and collaborative work, such as the creation of digital instructional support materials
- An information technology infrastructure with unilateral access to content in all formats to facilitate cross disciplinary research (for example, medicine and law, pharmacy and business, liberal arts and sciences)
- A comprehensive range of electronic databases linking citations to full-text information and ubiquitously available to everyone affiliated with the university, regardless of location
- Print resources developed according to institutional mission but shared seamlessly across the research university system
- Desktop delivery of print and electronic resources to offices, other libraries, and remotely to off campus students and faculty
- A unified online catalog for seamless identification of and access to information resources
- Onsite borrowing and delivery of library materials from all libraries by all users of the research university system
- Access to national and international collections through resource sharing agreements negotiated for the library system (Center for Research Libraries, NERL, NN/LM, OCLC, PALCI, Research Libraries Group, etc.)
- Online reference service 24 x 7

- Creation of and access to digital resources for teaching and research

This new model is based on the understanding that:

- It guarantees that no constituency will receive less support or fewer resources than are currently provided.
- It responds best to the views and concerns expressed by the Commission for change and improvements that are real
- It builds on collective library strengths that currently exist at NJIT, Rutgers, and UMDNJ
- It is better aligned to coordinate collection development and library service policies, and thus offers a robust and sustainable policy framework
- It can maximize resources over the long-term, take advantage of economies of scale, and ensure continuous improvement in the efficiency and effectiveness of the New Jersey research university library system
- It strengthens and expands personnel expertise and information management capabilities through coordinated recruitment and professional development programs
- It enhances the capacity to secure research grant funding, foundation, and other external support for all library programs and collections
- It enhances each university's competitiveness by responding to distinct regional needs and services, while benefiting from the strengths and economies of an integrated system
- It presents greater fiscal flexibility to direct funding to strategic strengths, enhances system-wide infrastructure, and ensures accountability to each campus

The new vision for the public research library system cannot be realized through a consortial model where participation is "purchased" and collaboration is voluntary. The research library of the future is not a composite of commercial products and services that are acquired. The outstanding research libraries of the future are being built now on a continuum of technology enhancements based on open systems and standards that mandate coordination and interdependency to succeed.

Assets

New Jersey has two major factors that facilitate the development of an integrated public research library environment: compact geography and two institutions with a well functioning system-wide model in place: Rutgers and UMDNJ. The restructuring offers the opportunities to build on rather than de-construct and duplicate what we already have, capitalize on the synergies made possible by the small distance among the three universities, and maximize the value of interdependence.

Rutgers and UMDNJ current library system assets are attached.

Synergies and Commonalities

The integrated research university library system will need to develop a single library information system, share electronic resources across the research university system, train and re-deploy staff into new areas across the system, promptly deliver materials among libraries and universities, evaluate physical buildings for consolidated services, extend memberships and cooperative access arrangements, upgrade and make equipment and software compatible, and acquire video conferencing equipment for shared services and operations.

The libraries would look to IT for federated authentication and authorization, Internet2 membership and middleware development, network security, computer hardware and software discounts, shared IT expertise, access to people databases (preferably combined), and information about students who are cross-university registered.

Top Tier

To support properly the university's goal of achieving "top tier" status, the libraries must have financial resources commensurate with those of the top ranked research libraries. These resources are needed to acquire substantial scholarly resources, develop a robust digital infrastructure, and provide the required suite of supporting services.

Recommended Budget Exclusive of Medical Library

Research libraries in North America are measured and ranked by the Association of Research Libraries (ARL). The recommended goal is to achieve a rank within the top fifteen of ARL members over a period of five years. This goal applies to each university if the libraries are separated by region. At the conclusion of the five-year period, the minimum annual financial resources and the staff complement required at each university to achieve top status, exclusive of medical libraries, will be:

Library Materials Expenditures	$16,700,000
Operating Expenditures	$6,850,000
Total Library Expenditures	$40,500,000
Staff	466

Recommended Budget for Medical Library

Currently, there are no specific indices that rank academic health sciences libraries that is comparable to those of the Association of Research Libraries (ARL). The most authoritative resource for measuring the assets of academic health sciences libraries, 2001-2202 Annual Statistics of Medical School Libraries in the United States and Canada, 25th ed., provides comparative data on significant characteristics of collections, expenditures, personnel and services in medical school libraries.

Therefore, in order to construct a comparable model and table that applies to each university if the public research university libraries are separated by region, each

university would need to support its own academic health sciences library at the appropriate level to enable competitive collaboration.

The chart below shows that at the conclusion of the five-year period, the minimum financial resources and the staff complement required at each university to maintain competitive status among medical libraries will be:

Library Material Expenditures	$2,904,863
Operating Expenditures	$387,223
Total Library Expenditures	$5,953,060
Staff	41

Other Needs

The central campus has a specific and critical need for creation of appropriate and necessary facilities for medical library services through a combination of new and renovated space. The Robert Wood Johnson Library of the Health Sciences needs to be expanded, and the Library of Science and Medicine needs to be reconceived as a biosciences library. The latter will require construction of new space to relocate engineering, geology, and other materials elsewhere.

Other specific needs for which extraordinary funding will be required include:

- Development of a single library information system. Interim operations can be supported via Z39.50 and scripting or third party software, and the move to a single system can be staged, as legacy systems require replacement.
- Shared electronic resources across the research university system. Resources not previously available to all institutions will need to have their licenses expanded.
- Prompt physical delivery among libraries and universities. No university location will have all materials needed by its community.
- Evaluation of physical buildings for consolidated services. Consolidation might provide opportunities for recouping space for collections or public use.
- Extension of memberships and cooperative access arrangements previously held by one institution to all libraries will broaden opportunities for all students, faculty, and staff.
- Overall equipment and software compatibility will be necessary for effective delivery of services to the desktop and for users of multiple libraries across the research university system.
- Video conferencing equipment for shared services and operations will enable efficient and effective use of personnel time as well as opportunities for professional development and learning.

Academic Computing and the Network

The primary goal for computing is to provide the necessary IT services to support world-class research and instructional programs. We should take this opportunity to reexamine the IT services we provide, and the way they are provided, producing structures that will allow the new university to better meet its goals.

Overall model

The overall structure described in the background documents provided to the committee is a federation of three largely autonomous university. We assume that a full suite of services will be provided by each institution, but that there will be a coordinated approach to key middleware services such as directory and authentication, which facilitates building services that are available to the entire system. This federated approach is the core of next-generation software being developed by the Internet 2 community.

Because of the nature of the existing computing operations, it seems natural to use the Rutgers network and other key Rutgers components as the basic infrastructure for the new institution.

Rutgers currently has a distributed model for computing. Key applications and services are performed by Rutgers University Computing Services. (RUCS) However colleges and departments are largely responsible for supporting their faculty and graduate students, and for operating computing facilities physically located in their areas. RUCS provides various types of support for this, including central services, training, recommended approaches, tools, and forums for communicating with colleagues in other units and with RUCS staff.

We expect that there will be a fairly large IT staff within the health services area, reporting to the Dean of the Medical School and/or the VP for Health Affairs. These will manage health-specific applications. In addition, health-related areas will have available services provided by RUCS, e.g. email and web hosting, and will also be able to take advantage of expertise elsewhere in the University, such as support for Distance Education currently in Continuous Education, and support for developing instructional material currently available from the Teaching Excellence Centers.

In outline form:

- Support for desktop systems will come from staff within the medical area, with support from RUCS.
- Support for general academic services such as email and web applications will come partly from staff within the medical area and partly from RUCS.

- There are a number of medical applications. These range from large systems such as Logician to small web-based applications that deal with some specific set of information. We recommend that these be handled by staff within the medical area. However some of the larger applications are probably best run from within a data center environment by staff with experience in running large systems. We propose asking RUCS to run these applications. Resources should be allocated to the medical area, which will subcontract to RUCS. This will maintain clear accountability, and will avoid having these applications compete with others being developed by RUCS with general University funding.

In general, we believe computing in the health area should be done internally to the Central university. However there are a few areas where it makes sense to maintain systems shared with the other universities. This will normally be highly specialized applications, where there are relatively few users and it would be too costly to support multiple implementations.

Resource Issues

UMDNJ currently has a highly centralized model for computing. Even applications specific to individual departments are normally developed by a central IT organization managed from Newark. We do not believe it would be attractive to continue doing these with a single organization in the new structure. The simplest approach would be to split the existing central organization across the campuses, working within the health affairs areas of the new institutions. Doing this will almost certainly require some additional staff. Some of this can be made up by taking advantage of services available elsewhere in the universities. However it is still likely that the reorganization will require some additional staff, and in some cases will also result in increased software licensing costs.

There are some areas where increased investment is going to be needed in the universities' central computing organizations. These are primarily areas where UMDNJ is currently doing things that Rutgers is not. In some cases this can be handled by staff in the medical area. However in several cases these are services that world-class institutions should be providing to the entire institution. Thus this is an excellent opportunity for us to improve computing for the entire University. For example

- In order to support common services across the three universities (particularly in the library area), we are going to need to invest in "middleware." This includes directory services and authentication. These are areas that we should be investing in anyway, but this restructuring is going to make it impossible to avoid.

- In order to meet the privacy and security requirements for health care, we will need to invest in security tools such as public-key encryption. The alternative is to confine these to the health-related areas. However this is not attractive. It would require the health-related areas to run duplicate mail and web services, and it would deprive the rest of the university of services that many other universities are now providing to the entire campus.

These are almost certainly not the only such examples.

The Network

As with other areas of IT, the overall network design will be a federation. Each university will have a network with its own internal routing. These networks will be connected using technology designed for inter-institutional communications. While still providing transparent access across institutions, these inter-institutional connections will provide the necessary level of isolation so that activities of one institution do not interfere with activities of the others.

As part of creating the new university we will need to merge the networks in the New Brunswick/Piscataway area. Because of the relative sizes of the networks, it makes sense to look at the existing Rutgers network in NB/Piscataway as the core of the combined network. This merger is fairly straightforward, although not cost-free. Links currently provided by UMD would be replaced by integrating the buildings into the Rutgers Sonet ring. This would result in a significant increase in bandwidth.

The more serious problem is that UMD's network is currently in need of significant work. Buildings in the NB/Piscataway area currently use a mix of shared 10 Mbps and switched 10/100 Mbps networks. This is significantly slower than the current Rutgers standard. UMD has internal proposals to update this. If such an upgrade has not been done by the time of the reorganization, it will need to be done then. This project is of the same nature as the RUNet 2000 project, although a smaller number of buildings is involved.

Towards a World-Class University

Part of the charge of this group was to look at areas where investment might be needed to help produce a world-class institution. IT is a critical area for this. There are a number of areas in which a simple merger of Rutgers and UMD resources will not produce world-class results. Among the most important are

- Support for the kind of high-end computer facilities needed to do modern applications. Other members of Internet 2 have invested in network-based multimedia facilities (e.g. the kind of facilities needed to do remote surgery), and have University-level resources for high-performance computing. This would be an excellent opportunity to develop these facilities.

- Support for computer-based instruction. Both Rutgers and UMD have done some initial work with online education, including both distance education and systems such as WebCT. However neither institution has made the commitment necessary for these tools to be used throughout the institution.

- Support for Middleware and PKI. As indicated above, the new institution is going to need to make significant investments in middleware and PKI, in order to permit joint work across the three universities, and to comply with current privacy and security regulations for health care.

Vision for Clinical Information Systems

The overarching vision for clinical information systems in the restructured university is based on the following elements:

- A paperless system that links clinical data from all sources into a seamlessly integrated electronic record.
- Provide all relevant clinical data to clinicians when needed, regardless of the source of the data or the location of the physician.
- Knowledge management and decision support for clinicians.
- Support for administrative functions including registration, scheduling, billing, authorizations for services and utilization-review.
- Support for communication with patients and among providers
- Support for outcomes assessment and performance-improvement.
- Support for clinical research.
- Management and design of clinical systems must have systematic input from clinicians.

Both Rutgers and RWJMS favor local management of user support, including specialized support for clinical applications.

Existing Resources

Rutgers currently is not responsible for any clinical information systems. The current resources in use by RWJMS include

1) The Logician Electronic Medical Record (EMR) which is in use by all ambulatory practices and is managed by UMDNJ central administration. Logician is hosted by the central Health Management Information Systems (HMIS) group which is part of IST, UMDNJ's central IT organization. User support for the Logician application (which includes training and customization) is performed by a specialized dedicated staff that is separate from the generic desktop support team.
2) The IDX practice management system that is used by the Robert Wood Johnson University Medical Group (RWJUMG) and by the faculty practice at the School of Osteopathic Medicine (SOM). This system is managed independently by each faculty practice (2 separate implementations) with some support from UMDNJ Central Administration.
3) The University Behavioral Health Care (UBHC) system which is independently managed by UBHC. UBHC is different from the faculty practices in that it is a university-wide entity, that is separate from the faculty practices, but includes faculty members from all of them. It is likely continue as a unified entity despite the restructuring.
4) Clinical Systems at Robert Wood Johnson University Hospital (RWJUH). While these are not managed by the medical school or the hospital, they are relevant to

the IT needs of RWJMS because RWJUH provides results to RWJUMG of tests performed in the hospital and because data from hospital admissions is needed by the RWJUMG outpatient practice. Conversely, outpatient data (primarily office visit notes) are shared with the hospital. Although other hospitals are major affiliates of RWJMS, RWJUH has special status as our flagship clinical teaching hospital and also because of its physical proximity to the medical school.

Recommendations

The restructuring comes at an opportune time to consider reorganization of clinical systems. The Northern campus of UMDNJ (New Jersey Medical School and University Hospital in Newark) plans to switch its ambulatory practices to the Epic EMR in order to facilitate integration with their inpatient information system (which is also an Epic product). This will leave RWJUMG and SOM as the sole users of Logician. This will provide an opportunity for both organizations to consider whether to continue to use Logician or to adopt another product. Since the support for Logician is provided by a dedicated team, many of who are located at the local campuses, it would make sense to continue using these support personnel even though they are currently reporting through UMDNJ central administration.

The application and database hosting functions for Logician will no longer be needed by UMDNJ or by NJMS and therefore, it would make sense to move the application hosting to the central university campus. This may require purchase of new hardware and renegotiation of the contract with the vendor. To the extent that the personnel currently carrying out this function are shared with other applications (including the new Epic EMR) or choose to remain with the Northern campus, this would require additional personnel for the application hosting.

As noted above, both Rutgers and RWJMS favor local management of user support. This would ideally be handled by a new IT organization, based at and managed by the medical school.

The practice management systems of RWJUMG are relatively self-contained at this point and could continue to function as they do now without any significant restructuring. However, better integration of administrative and clinical systems should be pursued, both to improve data sharing and because many RWJUMG personnel are users of both systems.

Potential Synergies

Both RWJUMG and the faculty practice of SOM (which will be part of the southern campus) use Logician as their EMR and IDX as their practice management system. With restructuring, it may make sense for these two organizations to share implementations of these systems. Benefits would include economies of scale, and sharing of customization ("clinical content") between the two organizations which is already ongoing.

Closer integration with RWJUH is needed, not only in IT planning, but also in sharing of network services and interfaces among clinical systems to permit data sharing. Data repositories useful for management and research should be developed jointly by both organizations.

Evaluation of whether Logician should continue to be used or replaced with a different system is beyond the scope of this planning document. However, it should be considered both separately and jointly by RWJUMG and SOM. One consideration is whether a different system could be integrated more effectively with the new RWJUH hospital information system.

Administrative Computing

Background on Administrative Computing Services:

Rutgers Administrative Computing Services (ACS) provides centralized application services, data management, systems management, and production operations for the university. The accompanying appendix provides a high level inventory of the breadth of services and systems covered by Administrative Computing Services. The systems and data have been planned from a university-wide perspective currently supporting the three Rutgers campuses. The computing center and organization are located on the Piscataway campus in the Administrative Services Building. There are 103 staff positions in ACS consisting of application developers and analysts; database administrators and data analysts; system administrators, networking and technical support staff; operations, data control, and data entry staff; security and access control; project managers; administrative support staff and senior management.

Given the planning premise of having three completely autonomous independent universities in the northern, central, and southern part of the state; the three existing universities will need work jointly with their new partners to determine their future operating model. For ACS this can be viewed as both a merger and a divesture. A merger with UMDNJ New Brunswick Piscataway campus and a divestiture of Rutgers Newark and Camden. For IT, the implications of such a change are significant. Detailed planning committees that include administrative leadership (academic and business related) and IT will need to be convened in the future as the operating model begins to take shape which in-turn will drive IT Administrative Computing and Data Management implications. The following are generic issues and considerations that will need to be addressed regardless of the future planning details:

- Services and contracts associated with IT infrastructure will need to be assessed both for Rutgers NBP to divest operation to Newark and Camden and for UMDNJ to divest to NBP. This would need to include software licensing contracts, outsourcing agreements, as well as other contractual IT services.

- A business decisions will need to be made on the handling of historical data across application and business areas. How much historical data exists? Is it consistent going back in time? How will it relate to the new operating model for the U-NJC

- Given the age of the existing administrative systems at Rutgers, consideration must be given to whether it is best to modify Rutgers administrative systems to support UMDNJ NBP or whether a phased transition to new administrative systems is a more logical approach. This will depend largely on the extent of the changes required to support the operating practices of U-NJC as well as the implications of divesting Newark and Camden administrative operations.

- Applications and services such as those listed in the appendix provide examples of the areas in which business practices and operations will need to be examined and

assessed to determine the new model of operations and in-turn the impact on IT systems.

- Although not directly an IT consideration, the training implications and change management aspects of the new merged structure will impact all three organizations. Implementation and transition planning must take into a communications and training component for staff, faculty, and students. The quality of this effort will have a direct impact on community acceptance, IT and overall success.

- Analysis and planning will be required for the decoupling of support systems (UMDNJ's and Rutgers) and the remapping of current data to a new model of operations and IT systems (Northern, Central, and Southern). For this to be successful, the primary support organization of the current model must be intimately involved and provide support and assist with data analysis and systems (i.e. data definitions, interpretations, data extracting and data cleanup) for the new model (U-NJC) and organization to be successful.

Appendices: Major Assets

Rutgers library

COLLECTIONS
- Books, journals, media
- Depository collections
- Digital collections
- Electronic resources
- Special collections
- University archives

SERVICES
- Access to collections
- Classroom instruction and tutorials
- Copying, printing, scanning
- Discipline liaisons
- Document delivery
- Exhibitions
- Interlibrary loan
- Outreach programs to State and profession
- Reference and consultation
- Website

TECHNOLOGY

Hardware
- Building and system servers
- Public and staff workstations
- Copiers, printers, scanners
- Digital cameras
- Sound and video editors
- Digital storage units
- Microform readers/printers
- Media equipment, including camcorder, projectors, Kurzweil, televisions, videocassette recorders
- Teleconferencing systems
- Wireless networks

Software
- Sirsi Unicorn System
- Novell, Oracle, Unix, RealServer/Helix
- Luna Insight
- TimeTrack
- Jaws
- NetOp School
- Word processing suites

Spreadsheets
Plug-ins
Various packages for public and staff use

FACILITIES
Thirteen different physical facilities containing twenty libraries, centers, and collections serving three campuses
Three administratively separate libraries for alcohol studies, criminal justice, management and labor relations
Two law school libraries
RU-Online is the 26th library at Rutgers
Facilities include spaces and furnishings for collections, service desks, user consultation and study, instruction, exhibitions, media use, meeting rooms (including a 100-seat teleconference lecture hall), and library work

MEMBERSHIPS
Association of Research Libraries
Center for Research Libraries
Coalition for Networked Information
Council on Library and Information Resources
Interuniversity Consortium for Political and Social Research
Research Libraries Group
Roper Center for Public Opinion Research
Metropolitan New York Library Council
North East Research Libraries
PALINET
Pennsylvania Academic Library Consortium, Inc.
Virtual Academic Library Environment

COOPERATIVE ACCESS ARRANGEMENTS
Research Libraries Group Shared Resources Program
OCLC RLAC Reciprocal Faculty Borrowing Program
New Jersey Library Network and Statewide Library Services
Metropolitan New York Library Council
Princeton University
New Brunswick Theological Seminary Sage Library
American Hungarian Foundation
Whitman Library
Council for Higher Education in Newark
Newark Reciprocal Borrowing and Lending Program
University of Medicine and Dentistry of New Jersey
Urban Campus of Camden County College and Rowan University
PALCI E-ZBorrow and Faculty Reciprocal Borrowing
VALE Faculty Reciprocal Borrowing

PERSONNEL
- Administrators
- Library faculty
- Systems professionals
- Staff
- Students

OTHER
- Grants
  - Institute of Museum and Library Services
  - National Science Foundation
  - National Endowment for the Humanities
  - NJ Historical Commission
  - State of New Jersey
  - Others
- Training program
- Gifts and endowments

UMD Library

COLLECTIONS
- Books, journals, media
- Depository collections
- Digital collections
- Electronic resources
- Special collections
- University archives

SERVICES
- Access to collections
- Classroom instruction and tutorials
- Copying, printing, scanning
- Discipline liaisons
- Document delivery
- Exhibitions
- Interlibrary loan
- Outreach programs to State and profession
- Reference and consultation
- Website
- Clinical Librarian

TECHNOLOGY

Hardware
- Building and system servers
- Public and staff workstations
- Copiers, printers, scanners
- Digital cameras
- Sound & video editors
- Digital storage units
- Microform readers/printers
- PDAs
- Infrared syncing stations
- Teleconferencing Systems
- Wireless Network

Software
- Endeavor Voyager System
- Novell, Unix
- Word processing suites
- Spreadsheets
- Plug-ins
- Educational software packages

FACILITIES
- Five different physical facilities serving four campuses

- One administratively separate library for curriculum support for RWJ Medical School
- Facilities include spaces and furnishings for collections, service desks, user consultation and study, instruction, exhibitions, media use, meeting rooms and library work

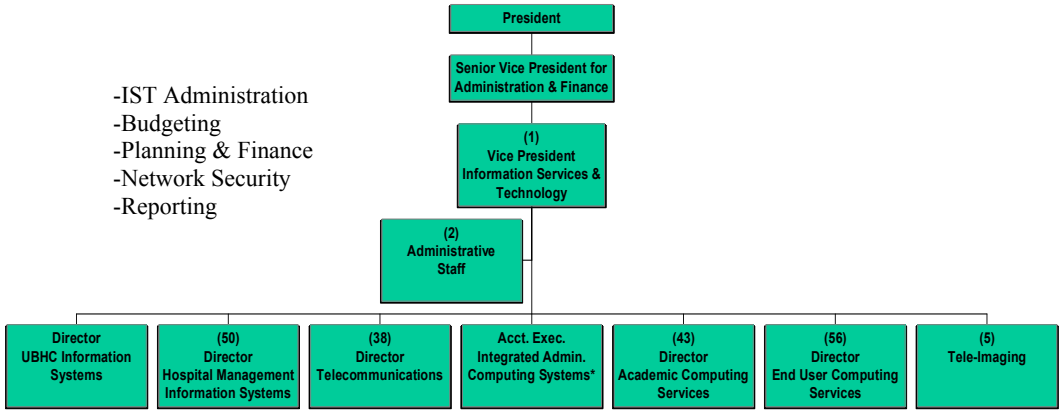
MEMBERSHIPS
- Medical Library Association
- National Network of Libraries of Medicine
- Association of Academic Health Science Libraries
- Health Sciences Libraries of New Jersey
- Regional Library Cooperatives of NJ
- PALINET
- Virtual Academic Library Environment (VALE)

COOPERATIVE ACCESS ARRANGEMENTS
- Major Affiliate Hospitals (Cooper, Kennedy, JFK)
- Coriell Institute
- Public Health Research Institute
- Cancer Institute of NJ
- National Network of Libraries of Medicine
- NJ Library Network and Statewide Library Services
- VALE Faculty Reciprocal Borrowing
- Rutgers University

PERSONNEL
- Administrators
- Library faculty
- Systems professionals
- Staff
- Students

OTHER
- Grants
  - National Library Medicine, National Network of Libraries of Medicine, NJ State Library
- Training program
- Gifts and endowments

UMDNJ Information Services and Technology Organization Chart



-IST Administration
-Budgeting
-Planning & Finance
-Network Security
-Reporting

***Outsourced**

-Pat. Accounting/Pat. Manageent Systems
-Patient Scheduling
-Logician Med. Record
-OACIS HL7 System
-Pharmacy System
-Nursing System
-Training

-Administrative, Student and Financial Systems
-Computer Systems Support

-Desktop Support
-LAN Design and Support
-University-wide E-Mail Support
-Campus Computer Store
-Service Center
-Training

-End User Support
-Data Entry & Control
-Back Office & Network Control

-Voice Communications
-Data Communications
-Video Conferencing
-IPTV
-Data Center
-Disaster Recovery and Business Continuity
-Training
-Change Management
Network Design

-Instructional Computing
-Research Computing
-Network Services
-Academic Media
-Training

1/19/01

Research Computing at UMDNJ

Academic Computing Services, often now in collaboration with the Informatics Institute, provides an evolving set of resources for researchers across the state. In general all products are available on all campuses, but there is clear concentration on the University's northern and central more research-intensive campuses.

Most applications are server-based, running from any one of the four campus HP-UX hosts, Silicon Graphics Workstations (SGI) provided by ACS or the Institute and maintained by ACS, a few Linux boxes, or on dedicated Sun servers. These platforms and applications have served the needs of people interested in broad areas of what is now called "bioinformatics," a.k.a., molecular biology, molecular modeling and statistics.

Applications. We use proprietary, free, and open-source applications. Our current bill to vendors for a maze of purchases, licenses and seats for UMDNJ is about $50-70K/year. I understand that industry would pay 10x that much. Renegotiating these contracts for re-structured institutions would be costly, I do not doubt.

Applications

Proprietary (Sequence analysis)
    GCG
Proprietary (Molecular visualization and analysis)
    Sybyl
    InsightII
    Spartan
Proprietary (Statistics)
    SAS –server based
    ACS also acts as an agent in licensing SAS-PC software.

Free (Molecular visualization and analysis)
    Gromacs
    Dock
    Autodock
    Amber7
Free (Integrated Product)
    Look

Platforms.

HP-UX Campus Servers (njmsa, rwja, rwjcam, pearl)
SAS
Sunfire 6800 Scientific Server (in Newark)
GCG and a variety of free products

~18 Silicon Graphics Workstations

Storage

Scientific applications can require substantial amounts of storage for scratch computation in progress and storage of completed projects. Management of that storage with user expectations being high is a challenge.

ACS has recently begun a switch to a very high capacity/availability SANs (Storage Area Networks) system which could become an important component in addressing these problems

Intangibles

People are an amazing resource and source of problems and solution. Researchers depend on the following kinds of services

Management that
- can help form a future, work with faculty and staff to satisfy needs, and work with administration and faculty to secure resources in traditional and inventive ways

Customer (user/account) systems and administrators that
- assures decent levels of security
- assures the converse of security: availability
- assures reliability
- trains, cajoles and develops customers into productive and responsible users of technology for the everyday

Education and support.
- Beyond general education, particular applications need support personnel. Unless an application is built into the curriculum of the institution, somebody agency must have application expertise to compliment the needs and content expertise of students, faculty, and staff

Network support
- in the short range future, one that fully capitalizes upon wonderful opportunities available through NJEdgeNet

Rutgers New Brunswick/Piscataway Academic Computing

What do we do?

- All central computing except network and administrative (some support responsibility for them)
- Basic central services: email, calendar, web hosting, Unix timesharing, mailing lists. Includes mailing lists generated from administrative data
- Student labs – 13 labs, widely used. Many depts. have their own, but not open the same hours or with strong user support. Good funding through student fee. Large student cadre
- Departmental support – regular meetings with dept staff, mailing lists, web info, some training, planning assistance free; one major goal has been to build a campus community. Now developing tools to automate software distribution and updates: first major product is automated antivirus software updates.
- Chargeable services – computer store, computer repair, contract system administration, application development (typically for web-based applications, often data driven)
- Help desk – developing into front door for all RUCS services, training, documentation; includes support for networking in residence halls
- Security – scan network looking for vulnerabilities, help depts. with problems, going around the University helping departments do security plans – more an issue of support than a technical one. [Information Protection and Security is not actually part of NBCS. It reports to the Chief Technical Officer, who happens also to be the head of NBCS.]

A few specifics

- Wireless – have developed wireless model, will run systems for departments under contract, doing public areas
- Student management – we use students in many areas, have a single group that does hiring, coordinated approach to training, evaluation, promotion
- Intranet services – developing a package of services for departments that want to have their own services using our facilities: mail, calendar, web hosting
- Web application development – area of rapid growth, limited by space to put staff; one of our strongest groups of staff
- Information Protection/Security is currently meeting with all departments, either singly or in small groups, to help develop security plans.
- 24x7 operations coverage, generator backup for power

Instruction and research

- Decentralized environment. A lot of work is now appropriately done in departments
- Research: NBCS only has facilities that are beyond what is reasonable in a department
  - *LDS [facility for large-scale statistical work, some funding from users, special security for sensitive data]*
  - *Large parallel machine [not in our area, but we supply resources]*
  - *Infrastucture for distributed high-performance computing (cluster computing) exists on campus, but resources are located in the department*
- Instruction
  - *Primary support for faculty doing instruction is from the Teaching Excellence Center.*

WebCT – was originally recommended by the TEC; we operate it, they do faculty support. This is a system for faculty to build course web support; can put students into a course automatically, based on roster information

Many faculty prefer to do web pages using standard web development tools. NBCS and departments both have web hosting environments for this. Currently doing a pilot for access controls based on roster information.

Information Protection and Security

Approach centers on support

Uses abuse reports and scanning to locate systems or departments that need attention

Then work with department that have weaknesses identified

More proactive approaches: departmental meetings to help departments develop security plans, scanning for vulnerabilities

Resources

In addition to normal State budget ($1.1 M other than salaries);

Student fee income, ca $3M. Used for operation of the public labs, including replacing equipment on a 3-year cycle, paying for student staff, operation and upgrades of central Unix facilities used for student services such as email and web hosting.

Residence hall support, ca. $500K. Much of this goes into student staff doing support.

Computer store and repair: ca. $5M gross. Goal is to break even.

Software resale, ca. $500K. Largest volume is Microsoft software

Full-time Staff

Count: 87: 55 State funding, 32 charged back to users in one way or another

NBCS State: 51

Labs: 7 [includes central support for the labs and staff doing wireless implementations]
Departmental support: 8 [includes one dedicated to Old Queens]
Information Protection and security: 5 [includes a director and one shared line]
Central systems: 18 [systems, 3-shift operations, 1 long-term assignment to CAIP]
Help desk, user support and training: 8
Directors: 3 [other managers counted in their areas]
Administrative Assistant: 1

Aux (charged to internal budget, which is primarily State funding): 2

Aux (charged to depts. for departmental support): 11

Aux (Computer Store/Computer Repair): 8

Residence hall networking (ultimately funded by students): 3

Student fee funded: 11 [These are both in labs and central services dedicated to students]

Administrative Computing Services, Rutgers

The following is a high level inventory of the key application systems, web services, and data warehousing initiatives occurring in Rutgers Administrative Computing Services Division. This is not meant to be inclusive but rather to provide a starting point for discussion. The data management, analysis and architecture for the services and systems highlighted below are planned across all functional areas and applications to facilitate data integration, consistency and integrity across the institution. The systems below are supported by various technologies running across multiple platforms (IBM/mainframe, Sun/Unix and Windows), multiple database systems (IMS, Oracle, and SQL Server) and multiple programming languages (Cobol, Oracle Forms/Reports, PL/SQL, and Java).

Core Administrative Application Areas:

- Student Information Management and Registration
- Financial Aid Management
- Student Billing and Payment Processing
- Course and Room Scheduling
- Undergraduate Admissions Processing
- Graduate Admissions Processing
- International Student Tracking
- Student Health System/Student Health Online Tracking
- Student Post Office Management System
- ARTSYS Articulation System

- Financial Accounting
- Accounts Payable
- Purchasing
- Budget Preparation and Management
- Off-Campus Reporting

- Payroll
- Human Resources:
    - HR Info
    - Absence Reporting System

- People Database and Directory Services

- SEVIS

- University Calendar of Events System

- Institutional Research Related Systems:
    - College Assessment Research
    - Course Analysis System (CAS)
    - Student Unit Record Enrollment (SURE)

  - Institutional Research Reporting
  - Longitudinal Database

- Auxiliary Systems and key integration areas:
  - Housing
  - Dining
  - Parking
  - Facilities
  - University Telephone Office
  - RU Connection Card
  - University Computer Account (NetID)
  - University Libraries
  - University Foundation

Students and Prospective Students Services (Internet Based Application Services)

- Undergraduate Admissions Online Application and Application Status
- Articulation System (ARTSYS)
- Graduate Admissions Online Application and Application Status
- Graduate Admissions Index of Programs
- myRutgers Portal
- Financial Aid Online Document Status and Award Information
- On-line Student Registration and Individual Class Schedules
- Online University Schedule of Classes
- Student Self-Service Access to Grades and Transcripts
- Student Self-Service Access and Management of Directory Data
- Student Self-Service Statement of Accounts and Financial Payments
- Student Self Service (NB) Parking (Citation Payments and Student Permits)

Faculty and Staff Services (Internet Based Application Services)

- Class Rosters and Online Grading
- Course Synopsis System
- First Year Sectioning
- Faculty Survey
- Course Analysis System (CAS)
- Articulation System/Electronic Transcript (ARTSYS/ET)
- Undergraduate Admissions Application (Administrative Site)
- Student Grades and Transcript (Administrative Site)
- Student Financial Services Statement of Accounts (Administrative Site)
- People Database (Directory Services) Specialized views for targeted Groups
- Faculty/Staff Self-Service Directory Management
- Procure-to-Pay System (Internet Procurement through Payment Processing)

General Services (Internet Based Application Services)

- Online Directory Services

- Calendar of Events

Data Warehouse Areas for Reporting:

- Student Data Warehouse
- Course Data Warehouse
- Graduate Admissions Data Warehouse
- Human Resources Data Warehouse
- Financial Data Warehouse
- Web Online Payment For Individual Areas

The Rutgers Network

The Rutgers University Network (RUNet) is constructed utilizing modular and layered infrastructure consistent with industry best practices. Building networks are collected against an access router which enforces network policy. Buildings are collected into zones. Each campus consists of one or more zones. In this way, the infrastructure external to specific buildings utilized to construct and communicate across and between the campus zones is termed the intra-campus backbone. The intra-campus backbone is largely gigabit. Where there are multiple campuses, located sufficiently close together, they are collected into a Metropolitan Area Network (MAN). The infrastructure which connects campuses into a MAN is termed the inter-campus backbone and is multi-gigabit. The three primary regions, known as Metropolitan Area Networks (MAN) are connected utilizing high bandwidth optical technologies (SONET). Other remote locations are connected utilizing dedicated bandwidth of either T1 (1.5 Mbit) or fractional DS3 (10 Mbit). These remote connections (MAN to MAN or other remote locations) are termed the Wide Area Network (WAN).

The five relevant structures in RUNet are listed as follows:

LAN
Zone
Campus
MAN
WAN

Each layer communicates only with the layer above and below. Within a specific network layer, modular and comparable architectures are constructed. Technologies may vary between respective layers, but are standardized within a layer. In this way, bandwidth, stability and overall performance aggregate independent of location. Each building on RUNet experiences an equal path to the core of the network and is equidistant from the Internet hand-offs. The requirement that each and every LAN be served from a centrally controlled router creates a complete policy perimeter for RUNet. A Consistent and unbroken policy boundary around the edge of RUNet permits a policy free core that performs at the highest level.

The RUNet model is flexible and extendible. The incorporation of other institutions should follow the model of the largest, most modular network. In New Brunswick, the addition of UMDNJ locations to the network would consist of landing remote connections in a fashion consistent with existing Rutgers remote connections. These would collect at a relatively small number of local points. Assets immediately in the vicinity of Busch campus would simply join the existing Rutgers network as either part of an existing zone or as a new zone. Regardless, these locations would become part of the Busch campus network and would relate to other campuses in the area across the New Brunswick inter-campus backbone.

The Northern location is less well known. Ideally, the composition of infrastructure should follow a mult-zone model (a super campus) or two or more campus groupings should be constructed. A multi-campus northern region would require the construction of an inter-campus backbone. Regardless, a single northern MAN would still be constructed. It is likely that significant work would be required for all of the backbones in the northern region to be rebuilt in accordance with the Rutgers model and consistent with the Rutgers standard.

The Southern location does not benefit from collocation. It is not clear what might be the best combined infrastructure. Instead, the southern region might elect to build multiple single campus MAN regions. These would connect to each other as well as to the other regions across dedicated WAN infrastructure. Regardless, respective locations in the southern region should be required to conform to the Rutgers architecture and the Rutgers standard.

Building infrastructure varies significantly across both Rutgers as well as NJIT and UMDNJ. The Rutgers RUNet2000 project resulted in tremendous progress in both backbone as well as building infrastructure. However, while it was applied to the majority of buildings at Rutgers, it was not uniformly applied to every building. It was estimated that the cost to complete phase II of the project and complete every building would cost approximately 40M. Similar projects should be initiated at the other locations for the combined institution. The cost for this is not known at this time.

Telecommunications Division

The Telecommunications Division (TD) is a university business unit with responsibility for the design, implementation, operation, maintenance and evolution of central voice, video, and data networks. These telecommunication infrastructures are critical utilities at the university and are fundamental to the success of research, teaching and learning.

The major components of the Telecommunication division are as follows:

Network Architecture
This group is responsible for defining data network reference models and design specifications, designing network infrastructures, performing technology research and development, and providing technology support for the Network Operations team. The Network Architecture team's primary responsibility is to provide network designs for

the ongoing development of RUNet. The mission is to bring the principles of network engineering and sound network management to bear in our network designs.

Network Operations
This group is responsible for the operation, maintenance, and management of the data network for Rutgers University. The team's primary responsibility is to maintain a stable, reliable infrastructure. This is accomplished by developing the policies, procedures and tools to provide monitoring, troubleshooting, and management of network devices and services. These efforts are coordinated through the Network Operations Center, which is the communications hub for all problem reports, change requests, and network infrastructure support.

Network Services
This group is the telecommunications internal development, database administration, and Internet development group. It designs, builds, deploys, and maintains Internet application software that facilitates network management for RUNet. Together with Network Systems, it delivers much of the ancillary infrastructure required to place and manage equipment on the university network.

Network Systems
This group maintains and operates the computing resources of the division. The group handles support for the desktop PC's, Unix timeshare systems, and Unix servers utilized by all the other areas of TD. In addition to its operational and user support role the group also handles many development projects in the areas of systems automation, application integration, and key network services including DNS, DHCP, Kerberos, Safeword, and RADIUS.

Network Plant
This group designs, implements, documents and maintains the university fiber optic cable distribution system. This includes both dedicated, custom infrastructure in addition to right-of-way acquisition. This group also has primary responsibility for the design and implementation of the university's CATV Hybrid Fiber Coax (HFC) video distribution system.

Video
This group is responsible for the delivery of the Rutgers University Television (RUTV) network's 64 channels to all connected users. This includes most of the students on the New Brunswick/Piscataway campuses and many administrative, instructional, recreational and other associated non-housing buildings. This group is responsible for the quality of the TV channels delivered but not the content or programming of those channels.

Network Installation
This group is a fee based auxiliary group that provides installation and troubleshooting services to the university. The Network Installations Group works with university departments on moves, adds, and changes to the current cabling infrastructure, as well

as to perform new installations. Also, this group is utilized directly by the Project Management Group in order to complete larger cabling projects.

Voice Services
This group manages all voice issues, questions and service requests. If it involves a telephone set or a telephone line, the Telephone Office will arrange installation, disconnect, changes, moves, and/or repair. They provide cost estimates for voice components like lines, equipment, wiring, voice mail, dialing features, i.e., anything voice related.

Student Telephone Services
This group is dedicated to providing voice service to students living in residence facilities. It serves more than 13,000 customers living on all campuses.

Project Management
This group is responsible for managing and tracking telecommunications projects at the university. It is comprised of staff who are responsible for compiling the necessary elements of a project, and identifying the needs for telecommunications components such as wiring, data electronics, voice electronics, video electronics and facilities construction. Each project is tracked by the staff from development through completion. The Project management staff coordinates the efforts of other groups within TD, as well as associated telecommunications contractors. The primary purpose of this group is to provide a seamless transition for the customer, from project inception through activation for any telecommunications initiative.

Through the application of industry best practices and by adopting suitable elements from corporate models, the university telecommunications division, consisting of approximately 60 staff, strives to maximize predictability, reliability, performance and service while minimizing surface complexity. Its' core approach is to apply strong project management to well engineered systems, building solid foundations on stable ground.

IT/Library Southern Subgroup Report

Principles

The following are principles that should help guide Library services.

1. We build upon the existing library strengths within Rutgers University and UMDNJ.
2. The new library system will allow "equal" access to a wealth of information resources for all faculty and students on any of the three campuses or remotely from their offices or homes or other work location.
3. The new library system should provide access to more resources for all users.
4. The new library system will allow for both economies of scale and the ability to change and incorporate new technologies quickly
5. Technological, distance learning, and web design expertise can be easily shared to benefit all three campuses
6. The citizens throughout the State of New Jersey will benefit by having the capability for on-site access to a research library in three locales, as well as virtually in a system with coordinated service and collection policies.
7. There will be greater fiscal, staffing, and infrastructure flexibility.

Any inspection of the extant physical library resources at Rutgers in Camden, UMDNJ at Stratford and UMDNJ/Robert Wood Johnson at Cooper (including the Coriell Institute) makes evident the fact that adequate resources are not now available to support a research level institution serving 10-12,000+ students with a full array of PhD and medical level researchers. It would require considerable additional resources for facilities, local collections, electronic resources, and staff before the libraries could reach the sort of critical mass necessary for a research level institution. There would also be a need for a significant investment in large-scale system resources for the creation of an integrated library catalog/information service which could be fully incorporated with other external information systems.

Presently, only the Law Library on the Rutgers Camden Campus is a full service library having both public services and a staff performing traditional technical services operations like cataloging, acquisitions, payment of invoices, and maintenance of an online catalog. This technical services staff does not now exist at either UMDNJ facility in the South or at the Paul Robeson Library. Also at these institutions there is no library staff devoted to systems support, public relations, fund raising, and grants. The faculty and staff at these two institutions have been primarily involved in the delivery of reference, instruction, and collection development. Only the most rudimentary technical services processing is undertaken.

Fortunately, both the UMDNJ libraries and the Paul Robeson Library at Rutgers in Camden have a long tradition of working successfully within a system framework, enjoying the many advantages of being part of large scale information organizations with

their wide range of offerings to a diverse set of audiences. We have the good fortune to be living in a time when information is becoming even more digital; and while we are aware that people will always remain part of any information content determination and information delivery system, we are cognizant of the many advantages offered by large-scale resource integration. It is exactly this sort of an organization which can emerge from a merging of library resources in New Jersey's public research institutions.

We, therefore, whole heartedly support the proposition being advanced as a "Vision for a Research University Library System". This model in its present form (represented by the RULS and UMDNJ systems) has serviced the research needs for our faculty in an environment that has taken advantage of economies of scale and allowed for efficient resource sharing of both materials and personnel. This model is even more economically viable for the three newly defined campuses as our libraries rapidly incorporate new methods for the delivery of all kinds of resources and services in a digital environment and contributes greatly to keeping costs down.

However, it must be noted that all library services cannot be delivered from a central locale within a top down organizational environment. There must be a level of local autonomy and staffing while maintaining the spirit and strength of a large library system. As the campuses in the South grow with more students, researchers, and faculty, there will be a corresponding need for additional faculty and staff in the libraries to support the demands of all these audiences, as well as the need for building renovations and additional space to support changing methods for delivering information and instruction. There will also be the need for close collaboration between the libraries in the south in building a vital information resource for our community and in creating a more effective interdisciplinary partnership between the three campuses. Finally, where the research interests differ from campus to campus there will be a need for collections funding to support distinctly local research needs.

Information Technology Vision for a Southern New Jersey University (UNJ-South)

Information Technology (IT) will play an important role in the success of a Southern New Jersey University (UNJ-South), made up of the campuses: School of Osteopathic Medicine at Stratford, Robert Wood Johnson Medical School at Camden, and Rutgers-Camden. It will be important to enhance university competitiveness by responding to distinct regional needs, and benefit from the strengths and economies of an integrated system.

The following are the principles that should guide the Informational Technology (IT) services and their use to assist academic and research areas of our University system.

Principles

1. We have an obligation to teach using the technology that our graduates will be expected to integrate into their work and practices (e.g., online continuing professional education; remote telemetry; telemedicine; provider specific, smart patient databases; web based tools, videoconferencing and other IT tools).

2. We have an obligation to apply technology to interdisciplinary, collaborative learning involving students from our different schools and disciplines. Emphasis needs to be placed on teamwork in education and in research within and between various departments.

3. Faculty and students learn and teach differently. Learners and teachers can collaborate in accomplishing integration of technology. In this effort, we must focus on student outcomes, not on the technology through which instruction is delivered. Competency-based outcomes assessment must reflect the knowledge, skills and attitudes requisite of our graduates to function with distinction. Mechanisms for review of educational innovation need to be integrated fully into the faculty promotion and tenure process. (Faculty Development)

4. University resources must be invested in preparing the students and faculty for integration of technology into our educational programs. University resources must be invested in the development of infrastructure to support contemporary instructional technologies. University resources must be invested in providing incentives to faculty for demonstrated excellence in application of technology.

5. There must be financial and resource commitments to Information Technology and its use with respect to education, research, health care services (Patient Care) and community. A robust IT infrastructure, made up of reliable industry standard hardware, software, network and new technologies will be required to provide expanded and seamless access to information for faculty, staff and students. We need to maximize resources, take advantages of economies of scale wherever possible, and ensure continuous improvements. We need to build upon the existing IT strengths within Rutgers University and UMDNJ.

6. Provide and continue the highest level of physician system support for the faculty and staff of the School of Osteopathic Medicine's Faculty Practice Plan. Support is required 7x24 hours at the clinical practices both on campus and remote satellites (60 miles radius).

The basic plan for IT services for a southern University will be to divide services (hardware, software, data, network, and other aspects of IT), into either a local campus based IT support system, or a central based IT support system. Both will need levels of integration, cooperation, and collaboration. This will result in minimization of

duplication of services and increased efficiency. The local campus IT support system will focus on academic, patient care and research support of students and faculty. This local campus IT support system will reside on the local southern campuses (School of Osteopathic Medicine, Robert Wood Johnson Medical School at Camden, and Rutgers – Camden). The university-wide central IT support system will focus on administrative support, and will reside on the central campuses in New Brunswick and/or Newark with support and services covering the local campuses. Below is a list of the different services provided by each IT support system.

Central Based IT Support System: (university-wide)

- Administrative IT support capable of supporting the budget, payroll, financial accounting (AP/AR/Purchasing), inventory control, personnel operations, and grant administration for an institution of the proposed size of UNJ-South. However, with minimal additional investment, this resource should be easily expanded to handle a growth of the institution to almost double the current size (i.e., 12,000 students).
- An administrative system capable of providing the technical support, operation, and maintenance of the "student records" for UNJ-South. Applications included in this operation would be: admissions, registration, financial aid, grades, transcripts, housing, student services, outcomes assessment, data warehousing, and information management. Whether these administrative systems are provided by current systems used by Rutgers, UMDNJ (such as Banner) or outsourced to another vendor, is an issue for future discussions.
- Support for negotiation for site license software, including McAfee Anti-Virus software, Microsoft products, Oracle, and others. The buying power of a large University will be important in this regard.
- WAN (Wide Area Network) and Telecommunication support, including connectivity to the Internet and to each campus (North, Central, and South) in New Jersey. Access to the campuses via Modems, VPN and other technology will be part of this infrastructure**.** It will be important to fully develop and utilize effectively and efficiently the voice, video, and data network required to support our research institution. Telephone management systems (telephony) and billing applications would be required to support the institution. New multiple internet handoffs (ISP) and ongoing costs for connectivity will have to be evaluated. At least OC3 connectivity to every UNJ-South campus must be included.

Local Campus Based IT Support System:

- IT support for academic services for all faculty and students. This includes support for campus-based and departmental computer labs, smart classrooms, account support, email servers, virus/spam filtering, web servers, file/print servers and other local services. System administration, web-ct/blackboard (course

management systems), chat rooms, internet-based and ISDN video conferencing for up to 7 simultaneous participating sites, mailing lists, newsgroups, web pages, calendaring and online exams are other important services that will need to be supported locally. Some level of office support for faculty and home support for all users will be also be needed.

- IT support for faculty and student research, including all of the above along with high performance computing needs will be required.
- IT support (end user computing) for all faculty and staff.
- IT support (physician systems) for the SOM Faculty Practice Plan (IDX Practice Management System, Document Management, Electronic Medical Record System and interfaces with core affiliates.
- Residential support for residence (dormitory) students, including network access, hardware/software support, and held desk support.
- Help Desk support, including the use of ticketing systems and perhaps 24x7 coverage will be vital.
- Planning, development, implementation, and communication of IT security and authentication must be maintained by the UNJ-South IT staff. This would be a new role that would require staffing to properly address/communicate the issues, keep informed about the constant threats to the network and servers, scanning, and proactively identify "holes" that could be points of attack by hackers. The security staff would be the central point for handling abuse reports and installing firewalls for the campuses. Specific authentication models (kerberos, enigma, others) would need to be established for the campus.
- There also needs to be administrative support on the local campuses, to support administrative staff with their IT needs and work closely with central administrative services. Some smaller or campus-specific local administrative applications may also need to run locally.
- Local area networking and local Telecommunications support and minimal wide area networking support (between campuses) would require additional local staff to properly manage and support the voice, video and data network on the local campuses, including wireless technologies. The distance between the Camden and Stratford locations will introduce new challenges to the IT staff to provide a quality support model.
- Online Learning (sometimes referred to as "Distance Learning") development and expansion to extend the delivery of instruction beyond the defined campuses to locations throughout southern New Jersey. In order to properly grow, new staff would be assigned to work closely with faculty to produce and deliver quality instruction through the latest technology. A successful development of online learning activities not only requires facilities capable of quality video/audio distribution, but also a first-rate video production studio staffed with knowledgeable technicians.
- Support for web based documentation, seminars and local education and training for the campus communities.
- IT planning and policy development would be an important role for UNJ-South IT staff. This includes Disaster Recovery planning and use of commercial disaster recovery sites (like SunGuard).

- Facilities for a computer store and repair facility, available to all faculty, staff, and students would be beneficial.
- Support Staff needed to promote faculty use of technology in instruction will be required (similar to the mission of the Teaching Excellence Centers at Rutgers). This group will support faculty creation of web pages, streaming video/audio, and other new technologies to be used in instruction.

There may also be some research and instructional applications that are developed on one campus, but are shared to all others (north, south, and central). The administration and support of such applications may fall under the Central Based IT Support System or under the auspices of the campus that developed the applications.

All of the above IT services will require increases in IT staffing, funding, and other resources. Staffing and resources for help desk, residence support, networking, security, system administration, administrative support and faculty support will need to be increased. Increases in lab spaces, staff offices, servers, applications and space for increased network infrastructure will be needed as well. Expanded operation room will be required including power generators, enhanced UPS and HVAC facilities. Network connections between campuses and with the Internet will have to be increased. Enhancements to hardware, software, and network devices will also be required to support UNJ-South. As the campuses grow in population to 10,000 to 12,000 students, there would be further requirements for additional expansion in all of these areas. With proper funding, increases in staffing and other IT resources, the UNJ-South campuses will be successful.