UNIVERSITY OF CALIFORNIA, ACADEMIC SENATE

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Office of the Executive Director, Chief of Staff   *Assembly of the Academic Senate*
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February 14, 2008

SYSTEMWIDE SENATE COMMITTEE CHAIRS
DIVISION CHAIRS

**RE: Systemwide Senate Review of the UC Information Technology Guidance Committee (ITGC)
          report, "Creating a UC Cyberinfrastructure"**

Dear Systemwide Senate Committee and Division Chairs:

On behalf of Chair Michael T. Brown, the UC Information Technology Guidance Committee (ITGC) report, "Creating a UC Cyberinfrastructure" is forwarded to you for review and comments. Specifically, we ask that you carefully review the report's recommendations. As background information, former Academic Council Chair John Oakley and former Senate Committee Information Technology and Telecommunications Policy (ITTP) Chair David Messerschmitt were active members of the ITGC. They along with members of ITTP were actively involved and consulted in the preparation of this report.

As you will notice the Provost has requested a response by April 24th, 2008. Given many other pressing timelines, we would like to extend the deadline a bit and attempt to slate the discussion of this issue on the May Academic Council (AC) Agenda. In order to meet the required AC Agenda deadline, we are requesting that both **Systemwide Senate Committees** and **Divisions** submit responses by no later than **May 5, 2008.**

As a reminder to Systemwide Senate Committee Chairs, please note that **requests for comments are sent out to all System-wide Senate Committees. Each committee may decide whether or not to opine.**   Please notify the Senate Office either directly by emailing me or through your Committee Analyst, if your committee chooses not to participate in this review.

Cordially,

María Bertero-Barceló, Executive Director
Academic Senate

Encl: 1 (ITGC Report)
Copy: Academic Council Chair Michael T. Brown
        Divisional Senate Directors
        Academic Senate Committee Analysts

OFFICE OF THE PROVOST AND EXECUTIVE VICE PRESIDENT –
  ACADEMIC AND HEALTH AFFAIRS

OFFICE OF THE PRESIDENT
1111 Franklin Street, 12th Floor
Oakland, California 94607-5200

January 25, 2008

ACADEMIC COUNCIL CHAIR BROWN

Dear Michael:

Enclosed is the UC Information Technology Guidance Committee (ITGC) report, "Creating a UC Cyberinfrastructure," which I request undergo formal review by the Academic Senate, with comments returned to me by April 24, 2008.

The report completes the work of the ITGC, which I charged with identifying and recommending strategic directions to guide UC-wide investments in information technology (IT) and the academic information environment.

Through the creation of issue-focused work groups with broad campus representation, two rounds of campus visits, and consultation with a wide range of UC-wide groups, the ITGC offered a forum for identifying strategic investments in information technology and systems. The process included substantial guidance and input by the Academic Senate, including representation on the committee by former Chair John Oakley and former Information Technology and Telecommunications Policy (ITTP) Chair David Messerschmitt, and with consultation with the ITTP on several occasions throughout the 18-month planning process.

The report recommendations reflect the thoughtful work of the ITGC members to:

- Identify strategic directions for IT investments that enable campuses to meet their distinctive needs more effectively while supporting the University's broader mission, academic programs and strategic goals.
- Promote the deployment of information technology services to support innovation and the enhancement of academic quality and institutional competitiveness.
- Leverage IT investment and expertise to fully exploit collective and campus-specific IT capabilities.

This report echoes throughout the need for the University of California to build on the strengths of its ten distinctive campuses. It identifies opportunities to collaborate and co-invest in a UC information technology "cyberinfrastructure" that avoids redundant or incompatible solutions to the University's pressing IT needs. It proposes a foundation in support of research, scholarship and instruction across the campuses, via a shared platform of essential IT infrastructure and services.

The ITGC recommends that the UC Information Technology Leadership Council (ITLC) be acknowledged as the UC-wide IT governance body, and, after the Academic Senate review process is complete, be responsible for guiding the implementation of the report's recommendations and next steps.

I appreciate your continued input in this very important process.

Sincerely,

Wyatt R. Hume
Provost and Executive Vice President

Enclosure

cc: Vice Provost Greenstein
    Associate Vice President Hafner
    Executive Director Bertero-Barcelo

Creating a UC Cyberinfrastructure

REPORT OF THE UNIVERSITY OF CALIFORNIA

Information Technology Guidance Committee

December 2007

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With the University engaged in long-term strategic planning through the President's Long-Range Guidance Team and my complementary UC-wide Academic Planning Process, there is no better time to focus Universitywide attention on the development of an information technology infrastructure that supports and integrates the University's academic and administrative activities.

To cost-effectively support UC's continued eminence, our long-term IT requirements and investments must closely align with and support campus and UC-wide goals in all areas, including research, teaching, student life, faculty and student recruitment and retention, development, public service, and administration. While most of the responsibility for achieving this alignment rests with the campuses, there are clearly opportunities at the UC-wide level to leverage campus and UC-wide investments, foster campus distinctiveness, enhance the University's competitive position, and avoid duplicative expenditures. The IT Guidance Committee process affords a welcome opportunity to cultivate a campus/UC-wide partnership to guide UC's strategic investment in a rapidly evolving information technology environment.

Wyatt R. Hume
Provost and Chief Operating Officer,
University of California, Office of the President

Executive Summary

In January 2006, the Information Technology Guidance Committee (ITGC), a group of University faculty, academic and business leaders, librarians, and chief information officers was charged by UC Provost Rory Hume to engage in a consultative, UC-wide planning process to identify and recommend strategic directions to guide investments in information technology (IT) and the academic information environment. The formation of this committee recognized the increasingly important role that IT plays in sustaining and enhancing the University's academic quality and competitiveness, as well as ensuring essential business effectiveness and efficiencies. Vice Provost of Academic Information & Strategic Services Dan Greenstein and Associate Vice President & Chief Information Officer Kristine Hafner served as ITGC co-conveners.

Through the creation of issue-focused work groups with broad campus representation, the ITGC offered a forum to explore how strategic investments in information technology and systems will advance the University's academic mission. (The scope of the ITGC did not include UC's five medical centers or the national labs, although continued partnerships among the campuses and their IT organizations are crucial). A wide range of campus and UC-wide groups provided input throughout the ITGC planning process (two rounds of campus visits were conducted), and this report's recommendations reflect this extensive consultation within the community.

The report echoes throughout the need for the University of California to harness the strengths of its ten distinctive campuses. It identifies opportunities to collaborate and co-invest in a UC information technology "cyberinfrastructure" that avoids redundant or incompatible solutions to the University's pressing IT needs. It proposes a foundation in support of research, scholarship and instruction across the campuses, via a shared platform of essential IT infrastructure and services.

The report is also an invitation to UC's IT leaders to play an expanded role in partnership with campus academic and administrative leaders to identify UC-wide IT priorities and mobilize to address them. UC's future IT initiatives must be shaped by systematic planning, collaboration and sharing of best practices and expertise in order to succeed in an environment of eroding public support and increased expectations of IT.

The University's institutional road map increasingly calls for technology-enabled services in every area of our mission. Investment in IT at the institutional level must be considered as fundamental as other infrastructure investments — a part of the cost of doing business for any research university. At the University of California, our local, state, national and global competitive strengths depend directly on our ability to plan for and deploy information technology for strategic advantage.

Summary of Recommendations

The recommendations in this report are organized in three categories: The Way Forward, Infrastructure and Services.

THE WAY FORWARD

- Acknowledging the critical systemwide role of the IT Leadership Council (ITLC), which consists of Chief Information Officers from the campuses, medical centers and Lawrence Berkeley National Laboratory, the ITGC believes the ITLC should be recognized as the UC-wide IT governance body. The ITLC should work in close collaboration with academic and administrative leaders at both the campus and systemwide levels.

- The ITGC emphasizes the necessity to fund information technology as critical infrastructure, and to change current funding models to provide sustainable, renewable funding.

- Collaboration is the way forward. To advance and leverage IT initiatives UC-wide, a variety of proven collaboration models are required, including multi-campus initiatives, functional collaborations and system-led initiatives.

INFRASTRUCTURE

- The University must invest in updating UC's network infrastructure, by connecting all UC institutions to the robust backbone network operated by the Corporation for Education Network Initiatives in California (CENIC) and by continually expanding network bandwidth and computing capabilities to anticipate growing faculty and researcher demand.

- The University must employ cost-effective and environmentally sound practices for the management of current data center infrastructure. To assess and address future needs and challenges, we must develop a new blueprint for providing scalable data center services to the UC community, services designed to leverage investments to accommodate future growth in computing demands.

- The University should deploy IT infrastructure, tools and services to support collaboration within the UC community.

SERVICES

- The University should build upon the current UC Research Grid prototype to create and deliver reliable, robust high-performance computing services and tools to research faculty who do not need (or cannot afford) to manage their own separate computing facilities.

- The University should create the capacity to manage scholarly digital assets in part by adopting strategies to ensure that the information produced in the course of research and instruction is effectively secured, managed, preserved and made available for appropriate use by others.

- The University should cultivate organizational leadership for instructional and student technology to guide and facilitate campuses working together to explore models for providing learners with enhanced and new IT-enabled educational opportunities.

Related Efforts:

Finally, this report acknowledges several arenas in which information technology will open new doors to business efficiency as well as provide innovative solutions to maintaining the breadth and scope of academic program offerings in a climate of competing and diminishing resources.

Vision/Role of Information Technology in UC's Future Success

"The University of California of 2025… is a university that holds true to its mission of teaching, research and public service by maintaining the quality of its world-class faculty, the foundation on which a great teaching and research university is built; by providing access by developing new modes of delivering instruction, expanding its infrastructure and ensuring affordability to all segments of California's population, including middle-income families; and by expanding its reach into California's communities through its health services, agriculture extension, academic preparation and other public service initiatives."

— Report of the President's Long-Range Guidance Team, 2006

As California's public research university, with roots deep in the land-grant mission of its founding, the University of California of 2025 will be dedicated to nurturing the talent of California's people, pushing the boundaries of global innovation and discovery, and creating solutions for the social, economic, environmental and health challenges of California that are at the heart of the University's work. This is the vision of the President's Long-Range Guidance Team (LRGT), which in late 2006 published its report "UC 2025: The Power and Promise of 10" about how UC can continue to meet the needs of the people of California.

Through the LRGT process and recent academic and administrative reviews, the University is being called upon to reinvigorate its commitment to serve the people of California and set a course for continued excellence for research and education in the 21st century.

Yet the University of California of today must contend with some daunting and immediate challenges. The University is being asked to do more with less, and to anticipate and proactively prepare for the future, all while faced with a reduction in state funding and other shifting external pressures.

The LRGT recommends that UC operate as a system that works as one university and leverages the strengths of its ten campuses for the benefit of all. It is clear that UC must adopt new models for working together across the system to maintain UC's global reputation for excellence, its place on the cutting edge of knowledge and creativity, and its relevance to the pressing needs facing California and its people.

Information technology is critical to UC's success in this future. It presents unprecedented opportunities for collaboration and coordination across traditional geographic and cultural boundaries. Strategic coordinated investments in IT can facilitate collaborative action across the UC campuses and increase the ability to offer high-quality services that advance our teaching, research and public service missions.

Information Technology is also changing the nature of the University itself — how we teach, learn and work is increasingly reliant on IT tools and services. For example:

- High-performance research computing makes it possible to collect data from remote experimental equipment, analyze that data with tools running on specialized computer clusters around the world and deliver it to researchers' desktops anywhere in the University. These capabilities help keep UC at the forefront of research by increasing the efficiency and effectiveness of research activities and facilitating collaborations among research groups around the world (for example, in predicting and analyzing earthquakes and assessing climate change effects on air quality).

- Learning is no longer bound by the constraints of the classroom. Internet-based collaboration and communication tools enable faculty to create new learning opportunities for students, as well as provide convenient access to learning materials from anywhere, at anytime. (For example, UC now offers an online course in Arabic, whose enrollment is open to students from all UC campuses.)

- Libraries have made great strides in leveraging IT to extend the reach of their services. Patrons can discover and access library collections at any time from any location with an Internet connection. UC's California Digital Library has been a pioneer and world leader in providing these types of services.

- Health care is also leveraging IT. Telehealth programs use high-speed networks to provide UC's world-class health care to people who live in rural and other under-served areas.

Development of a University of California cyberinfrastructure is critical to our success in tapping this potential. It is a fundamental element on which all innovations in teaching, research and public service will increasingly rely. Working together to develop a UC-wide cyberinfrastructure will result in our ability to improve the quality and expand the number of IT services available to the entire UC community.

Creating a UC Cyberinfrastructure

The ITGC envisions the UC cyberinfrastructure as a shared and distributed information infrastructure — encompassing the network, data centers, services, funding, governance and personnel — that supports academic and administrative functions across the university.

Developing a UC-wide cyberinfrastructure requires new models for funding IT and working together. Stable funding mechanisms, an ongoing governance body and collaboration across campuses and functional groups, are fundamental to moving this vision forward.

To succeed now and in the future, UC must plan for and invest in IT infrastructure as it does (or should) in physical infrastructure, such as power plants, classrooms, libraries and laboratories.
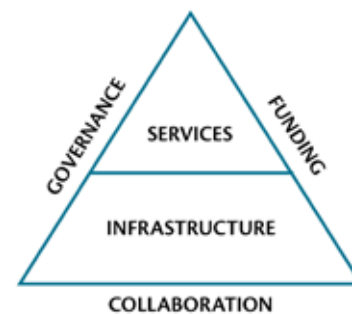
Recommendations

The recommendations put forth in this report cover a wide range of information technology investments, from platforms and systems to services and organizational structures that support UC in its mission of teaching, research and public service. Collectively they represent the initial building blocks of a UC-wide cyberinfrastructure, comprising several components:

- **Governance, Funding** and **Collaboration** to identify strategic investments and develop coordinated solutions.

- The **Infrastructure**, which is the foundation on which all IT systems and services rely.

- **Services**, which empower faculty, students and staff to be innovative in their teaching, learning and work.

These proposals move the University toward the goal of providing the UC community with universal access to those IT resources that are necessary to ensure future competitive advantage in the information-based environment in which we operate.

In addition, the ITGC has proposed principles for addressing administrative and business systems, which, in recent years, have been especially important to the University and hold great potential for realizing efficiencies by adopting common approaches across campuses.

These proposals, although offered by the ITGC, will be incorporated into an ongoing UC-wide governance process, under the guidance and leadership of the IT Leadership Council (ITLC). The ITLC will be responsible for their evaluation and implementation, as well as for providing guidance on emerging needs and initiatives.

"At the heart of the cyberinfrastructure vision is the development of a cultural community that supports peer-to-peer collaboration and new modes of education based upon broad and open access to leadership computing; data and information resources; online instruments and observatories; and visualization and collaboration services. Cyberinfrastructure enables distributed knowledge communities that collaborate and communicate across disciplines, distances and cultures. These research and education communities extend beyond traditional brick-and-mortar facilities, becoming virtual organizations that transcend geographic and institutional boundaries. This vision is new, exciting and bold."

— Arden L. Bement, Jr., Director of the National Science Foundation;
in "NSF'S CYBERINFRASTRUCTURE VISION FOR 21ST CENTURY DISCOVERY," March 2007

"… greater attention to planning, information sharing and the adoption of standard practices that enable local efforts to be harnessed to and benefit from the greater good, and crucially, the identification of systemwide as well as campus-based priorities…will require nothing short of a fundamental change in the University's culture, and attention to creating incentives for realizing that change."

— Report of the President's Long-Range Guidance Team, 2006

Governance

The ITGC was envisioned as the first step in an ongoing process for assessing UC-wide IT needs, reviewing investments and planning for the future. A formal governance body is needed to build on the work the ITGC started and to continue to plan, prioritize and implement UC-wide IT projects in collaboration with the University's academic and administrative leaders. Governance must involve a partnership between the providers and users of services and the IT implementers.

RECOMMENDATION 1   ESTABLISH THE IT LEADERSHIP COUNCIL AS THE UC-WIDE IT GOVERNING BODY

A governance structure — in addition to leadership and funding support — is essential for the successful design and delivery of the initiatives outlined in this report.

The Provost & Executive Vice President for Academic Affairs and the Executive Vice President for Business Operations should expand the constitution and charge of the UC IT Leadership Council — whose membership includes chief information officers (CIOs) and IT leaders from the UC campuses, Office of the President, medical centers, and Lawrence Berkeley National Laboratory — to become the UC-wide IT governance body.

The ITGC recommends the governance structure align with the following principles:

- The ITLC decision-making role should be direct in some areas (e.g., IT infrastructure and architecture) and partnership-based in others, for example working closely with major campus functional leaders (e.g., Executive Vice Chancellors, VC's Administration, VC's Research, VC's for Student Affairs, Planning and Budget Officers, Undergraduate Deans) and in consultation with the Academic Senate to identify IT priorities that serve the strategic interests of the University.

- The ITLC should develop a process to communicate and validate strategic priorities to the UC Provost, Executive Vice President of Business Operations, and Executive Vice Chancellors.

- The ITLC should oversee the implementation of strategic, UC-wide IT initiatives. Appropriate funding and adequate project staffing are required to fulfill this role.

- Increasingly CIOs are members of the President's /Chancellor's cabinet in research university organizational structures. The ITGC recommends that UC campus CIOs be consistently empowered and embedded within the UC leadership structure and that each campus consolidates its IT leadership in a single campus CIO or in a single voice represented in the ITLC.

Funding

The University of California needs a reliable, agreed upon IT funding framework. IT infrastructure funding commitments, including capital projects, personnel, hardware, software and services, cannot be made solely on an annual basis. A funding model is required that supports long-term strategic planning and lifecycle costing, and aligns IT investments with campus and University goals. Also crucial is a shared commitment across the University to identify common needs and, where appropriate, to collaboratively provide solutions.

The University of California's IT infrastructure must be reliable, and it must be designed to support current and future UC academic and administrative needs in a sustainable and cost-effective manner. To maintain such an IT infrastructure requires innovative approaches to how the University acquires, manages and invests the required financial resources.

RECOMMENDATION 2   FUND IT AS CRITICAL INFRASTRUCTURE

Immediate start-up funding will be required for the recommendations contained in this report. For the long term, the University will need to develop ongoing IT funding strategies, which the ITGC strongly recommends be consistent with these principles:

- Funding is stable and predictable in the long term and is not dependent on annual budget requests.

- A UC-wide coordinated planning and decision-making process effectively and strategically balances competing needs and available funding sources.

- Funding is earmarked for the information technology infrastructure component of capital projects.

- Life-cycle costing methods ensure adequate initial and ongoing funding for IT infrastructure investment and maintenance.

- Technology upgrade and enhancement funds enable the University to derive ongoing benefits from initial investments in IT infrastructure.

Working Together

UC institutions know how to collaborate when they see their collective interest in the balance. Successful collaborations include: the California Digital Library, Systemwide IT Contracts, the Corporation for Education Network Initiatives in California (CENIC) and joint development of the UC Effort Reporting System.

RECOMMENDATION 3   APPLY PROVEN COLLABORATION MODELS

To advance and leverage IT initiatives UC-wide, we should apply a variety of proven collaboration models, including:

- **Multi-campus initiatives —** a subset of campuses agree to collaborate on a system or service, or to adopt a solution developed by one campus.

- **Functional collaborations —** groups responsible for a particular function at some or all campuses get together to develop or adopt a shared solution that serves their functional need.

- **System-led initiatives —** campuses request UCOP to provide collaborative leadership in developing or implementing a shared solution or a uniform UC-wide solution for cost, fiduciary or other reasons.

INFRASTRUCTURE

The Network

A UC cyberinfrastructure that includes state-of-the-art network connectivity and a scalable data center computing services framework establishes the foundation for exploring, designing and launching a wide range of new services to support and enable the future operations of the University by:

- Providing the backbone for new research computing paradigms.

- Acting as a catalyst for new course delivery mechanisms.

- Enabling discovery of, and communication about, new knowledge.

- Giving our students powerful tools to enhance their educational experience.

- Connecting the University to business partners, alumni and the community.

The network is the central nervous system of the University — and it requires ongoing planning and investment to keep pace with new technologies. It is the foundation for scholarly and research communication and collaboration, for online access by students to course materials and digital resources, and for business transactions that run the administrative operations of the University. As such, it is a critical component of the cyberinfrastructure that allows UC faculty and students to access and transmit data in support of their scholarly activities across disciplines, among campuses and with peers throughout the world.

UC's continuing collective investment in its network backbone, through CENIC has proven to be a successful model for providing a quality of service that UC could not achieve by going it alone. A model for intersegmental collaboration, CENIC operates the fiber-optic backbone network that connects all UC campuses to each other and to national and international research and education networks. CENIC's next-generation backbone services promise unprecedented speed and capacity for conducting cutting-edge research and doing the business of the University in new ways. However, insufficient investment in local campus network infrastructure prevents the UC community from reaping the benefits of these expanded networking capabilities. Put another way, UC and its partners have built a statewide "superhighway" that will get us where we want to go faster and farther than ever, but our campuses have one-lane roads that produce traffic jams for those trying to get to it.

"Over the next five to ten years, UC will have to renew [the IT] infrastructure comprehensively and continuously to keep current with technological innovation, provide state-of-the-art experiences for students and support cutting-edge research. The pace of technology change is that rapid; the promise is that great."

— Report of the President's Long-Range Guidance Team, 2006

> **RECOMMENDATION 4   INVEST IN NETWORK CONNECTIVITY**
>
> UC's network infrastructure requires sustained investment. Our researchers, particularly in the sciences, do not have the bandwidth necessary to conduct cutting-edge research. UC has fallen behind peer institutions in its network infrastructure. To meet national and international research community standards, the following four strategies are recommended:
>
> • Connect all UC campuses and medical centers to the high-speed network backbone.
>
> • Upgrade the UC inter-campus network backbone for capacity and speed ("next-generation network").
>
> • Upgrade local campus network bandwidth by up to a factor of 10 to exploit the next-generation network backbone capabilities.
>
> • Give researchers the flexibility to create point-to-point high-speed connections when they need them.
>
> In addition, multi-year funding needs to be recalibrated to address the increased level of service the user community demands.

Data Center Infrastructure

Campuses have reached the limits of sustainability of current research computing models, where individual researchers acquire, house and maintain their own high performance computing environments. Having outgrown data center capacity and facing space constraints and the high cost of electrical power, many campuses are considering building new facilities. A coordinated approach presents opportunities to increase capacity, reduce environmental impact, address security concerns and optimize investments.

UC must act now to sustain its international leadership and future competitiveness. We must ensure that UC has the facilities to provide the computing resources it requires, that those resources and the information they contain are capable of being shared in support of UC research wherever it occurs in the world, that adequate staff support is available to faculty and staff to make effective use of these resources, and that we leverage this infrastructure to enhance UC's national and international competitiveness.

> **RECOMMENDATION 5   PLAN FOR THE NEXT-GENERATION UC DATA CENTER INFRASTRUCTURE**
>
> The University must analyze the cost and capabilities of current data center infrastructure, assess future needs and ultimately develop a new blueprint for providing data center services to the UC community that are cost and energy efficient, secure and designed to accommodate future demands. Creating a UC-wide disaster recovery service, building upon successful inter-campus partnerships, is an integral component of this next-generation data center plan.

Collaboration Infrastructure

With increasing emphasis on collaboration as a critical factor for UC's future success, an imperative is to develop tools and services to enable communities within UC to work more effectively together and with partners outside UC. Real-time collaboration tools such as web conferencing, desktop video conferencing and high-definition, studio-based video conferencing, as well as electronic forums and work spaces such as wikis, blogs, and shared document repositories and applications, should be made widely available and be supported more consistently for faculty, students and staff throughout the UC system.

RECOMMENDATION 6   DEVELOP IT INFRASTRUCTURE, TOOLS AND SERVICES TO SUPPORT COLLABORATION WITHIN THE UC COMMUNITY

The ITGC recommends that a process be put in place to :

- Assess the collaboration environment within the UC community and identify needs.

- Identify tools and services that will support these needs.

- Plan for the deployment of and support for these tools and services.

- Build upon UCTrust, a UC-developed federated identity management framework for secure business operations and transactions among UC institutions, to refine and expand collaboration services.

UC must partner with regional and national network service providers to accomplish these goals. In particular, these recommendations leverage UC's founding status in CENIC, California's regional network provider to K–20 institutions throughout California.

Fostering an environment in which UC institutions look to each other for partnership and best practices requires collaboration infrastructure and tools. The network infrastructure also provides a basis for research, instruction, telemedicine and business operations initiatives that increase the overall efficiency and effectiveness of UC's operations.

SERVICES

Although it is one of the foundational elements of a cyberinfrastructure, the network is invisible to those who depend on it to teach, learn, work and conduct their research. It is the services such as the computational, analytical and data management tools delivered via the network that empower the user community. Organizational leadership is required to identify those services that may benefit from strategic planning and investment on a UC-wide basis.

The ITGC is proposing that UC deploy the following services that leverage investments made in the IT infrastructure to advance the University's mission of research and teaching:

• UC Research Grid.

• Secure services to support information creation, discovery, access and preservation.

• IT to enhance educational opportunities across the university.

Crucial to an effective UC-wide cyberinfrastructure is a common IT architecture that establishes interoperability standards among the multiple components and ensures the ability to share information and expertise across these service areas.

"The University of California of 2025 will be student centered in ways that better leverage the depth, breadth and diversity of our faculty's expertise UC-wide. UC will leverage unparalleled experimental and research facilities, libraries, research data and other tools that foster scholarly collaboration on a worldwide scale to create distinctive educational experiences for our students."

— Report of the President's Long Range Guidance Team, 2006

UC Research Grid

As the research community works to solve ever greater and more complex problems, the University is challenged to design and deliver a comprehensive set of research cyberinfrastructure services to the research community. These include a wide range of computational, analytical and data management tools, the ability to harness idle computing cycles (wherever they reside) and the ability to manage, communicate and preserve electronic data that is developed and used by collaborating research groups. Fast networks and distributed, underutilized supercomputers are a good foundation on which to develop new models to serve the research community.

A shared research computing "grid" prototype is currently being piloted by three campuses (UC Irvine, UCLA and UC Santa Barbara) to demonstrate the ability to optimize utilization of campus computing resources that may be idle or underutilized at any given time. It has also highlighted the ability of UC campuses to think across campus borders when solving pressing problems.

The proposed UC Research Grid has three components:

1. High-performance research computing (shared computing cycles made available to those who need them).

2. Shared data storage (with ability to manage data sets).

3. Sophisticated analysis and modeling tools and services to allow the community to perform research.

RECOMMENDATION 7   DEVELOP UC GRID RESEARCH CYBERINFRASTRUCTURE SERVICES

The ITGC proposes that the University build upon the current UC Grid prototype to create and deliver reliable, robust high-performance computing services to research faculty who do not need (or cannot afford) to manage their own separate computing facilities. Such a strategy will conserve campus space and power, deliver more reliable computing environments, and relieve faculty and graduate students of the burden of maintaining complex IT systems as a sideline activity. The University should:

1. Connect all ten campuses to the UC Grid.

2. Design a blueprint for adding computing resources to the Grid.

3. Develop a suite of Grid services that are responsive to the needs of the research community and a support model that ensures successful exploitation of the UC Grid.

4. Identify UC research programs that are early adopters of the UC Grid and can help to refine the model.

5. Convene a group of research faculty and administrators to oversee the design and deployment of the UC Grid.

Deploying a UC Grid infrastructure must be seen within the context of the next-generation data center planning effort recommended earlier in this report, since much of the future demand for computing resources will be driven from the UC research enterprise. UCTrust, a federated identity management framework that facilitates secure business operations and transactions among UC institutions and with key stakeholder organizations, will be a catalyst for implementing secure grid services.

Secure Services to Support Information Creation, Discovery, Access, and Preservation

UC is in the business of creating new knowledge and making it available to the world. Whether it is a doctoral dissertation, course instructional modules or earthquake data collected by seismographs located throughout the state, appropriate stewardship is required to assure that the many information sources and the products of inquiry, research and instruction throughout the University are made available for discovery by others, and are preserved for future generations.

RECOMMENDATION 8   CREATE THE CAPACITY TO MANAGE OUR DIGITAL ASSETS

The ITGC recommends that in collaboration with UC's library community, and leveraging UC-wide data and information resources, the University mount a number of pilot projects that explore the feasibility of developing services to facilitate the lifecycle of information stewardship. Example projects include:

IT systems and services to enable sharing of instructional content

UC faculty produce an impressive array of educational materials. However, those materials are largely locked away in "shoe boxes," such as restricted-access learning management systems, rendering them accessible to only those faculty who create them and the students enrolled in a particular course (and for only a predetermined length of time). Faculty who wish to make their course materials openly accessible to other faculty and students or to others in the University or public communities face significant technical, service and cultural obstacles in doing so.

The University should determine the feasibility and desirability of collaboratively providing tools — to those who wish to make use of them — to store, access and share instructional content.

IT systems and services to enable faculty to share data sets and analytical tools

Leading-edge research in all disciplines is becoming both more collaborative and cross-disciplinary and more reliant on digital information — data, text, images and video — and advanced computational and networking capabilities. To support UC's research enterprise and increasingly to meet the expectations of funding agencies for effective data curation and data sharing, the University must adopt strategies to ensure that the information produced in the course of research is effectively secured, managed, preserved and made available for appropriate use by other researchers. In addition, effective use of the great volumes of research data now being produced requires the availability of sophisticated computational tools for management, display and analysis. The ability to effectively develop and share these tools enables better and more cost-effective research and fosters both collaborative and cross-disciplinary use of research data.

IT to Enhance Educational Opportunities Across the University

On UC campuses and universities around the world, IT is successfully being used to:

· Actively engage students in the learning process.

· Provide highly interactive activities in large enrollment courses.

· Enable students to participate directly with faculty in research, interacting with data and simulations, and discovering new areas of interdisciplinary inquiry.

· Provide greater access to learning opportunities across traditional campus boundaries and outside of formal courses.

· Prepare students with a range of problem-solving, critical-thinking and information skills required in an information-based society.

The ITGC proposes implementing services and structures across the UC system that have the potential to leverage campus expertise and resources to advance teaching and learning through the strategic use of IT. Recommendations in this area reflect the need for organizational leadership to support campuses working together to collectively address issues in common and to explore models for providing students with new educational opportunities.

RECOMMENDATION 9   CULTIVATE ORGANIZATIONAL LEADERSHIP FOR INSTRUCTIONAL TECHNOLOGY AND IT IN THE STUDENT EXPERIENCE

To leverage and share more broadly UC instructional technology experience, the ITGC recommends enhancing existing educational and student technology organizational leadership structures and creating new ones, if appropriate, to better:

· Provide a locus for coordinating and supporting UC collaborative instructional technology efforts.

· Provide a partner for Academic Senate and others discussing the future of instruction and the student experience.

· Build agreement around and encourage adoption of standards essential to information interchange, interoperability and re-use.

· Foster information sharing and community building key to both innovation in instructional applications of technology and their effective appropriate adoption.

· Support IT design and delivery needs of multi-campus educational programs.

It is also imperative to determine in what capacity the University can positively contribute to the "digital literacy" of students at all levels and to adapt mission-critical activities to modes that best elicit student skills and creativity. Opportunities include:

· Identifying common needs and developing strategies and shared solutions to address how the student experience can be improved through IT.

· Promoting student expertise in the use of information technology in their academic disciplines.

· Developing curriculum to prepare students to become facile and competent creators and consumers in a digital environment.

Organizational models should be developed in consultation with the campuses, UCOP and the IT Leadership Council.

Related Efforts:

The ITGC recognizes the importance of related IT efforts that are being implemented in various functional areas across the University. In particular, the ITGC acknowledges and endorses the initiatives underway in multi-campus educational programs and in administrative and business systems:

IT Support for Educational Programs and Courses Across Campuses

Demand for courses and programs that enroll students from multiple campuses is, by most accounts and perspectives, likely to grow in the coming decade. These programs, often offered at off-campus locations, such as Washington, D.C., Sacramento or foreign countries, are becoming increasingly important as laboratory experiences where students can become involved directly in organizations and activities that offer learning opportunities not available on a student's home campus. In some instances, online courses available to all UC students are provided by a campus or a consortium of campuses (e.g., Arabic without Walls, offered by the UC Language Consortium).

Additional benefits of multi-campus educational opportunities include:

- Graduate and undergraduate students alike can engage with ideas and ongoing research independently of where they are located.

- Pooling student demand from across the system, UC will be able to sustain instruction in specialized subjects which, if treated on a campus-by-campus basis, might atrophy.

- Such programs may offer a cost-effective way to offer components of emerging academic programs, particularly in interdisciplinary fields of study.

The Academic Affairs division at UCOP has already begun a strategic planning process to identify and address the needs of existing courses and programs that enroll students from multiple campuses. Although this process will initially focus on administrative issues, it provides a framework for exploring the potential of putting in place an IT infrastructure and services that facilitate instruction across campuses. The ITGC proposes that a study be done, in alignment with the greater strategic planning process, of the needs for such an infrastructure and, if appropriate, a pilot of such services.

Effective IT to Enhance Business Efficiency

Although the IT Guidance Committee focused its attention on information technology investments in support of the academic mission, we recognize that the University must have a solid foundation of business and administrative processes and systems to enable its teaching, research and public service. We can build on a UC cyberinfrastructure to offer opportunities to increase the efficiency and effectiveness of UC's business and administrative processing.

Multiple studies have assessed UC's IT needs in payroll, human resources and other administrative areas. *UC 2010: A New Business Architecture for the University of California (July 2000)*, proposed a road map to redesign UC's core business processes to enable the University to manage growth, control costs, improve the work environment and implement best practices. Information technology was viewed as a critical tool to transform UC's administrative support infrastructure.

Recent organizational reviews have reinforced the need for business efficiencies and improvements to administrative and business systems. Functional stakeholders from business areas throughout the University are addressing these issues and are forming critical partnerships with the IT community to successfully design and implement solutions.

A shared IT approach presents opportunities to address many of the recommendations outlined in the *New Business Architecture* report, including to:

- Standardize business processes.

- Increase productivity.

- Eliminate duplication of effort.

- Lower costs and business risk.

- Enable more informed decision-making.

- Ensure greater flexibility to respond to the changing landscape of the competitive environment.

Several initiatives are under way that illustrate the power of UC-wide solutions to problems that cannot be solved at the campus level, for example:

- Human Resources Information System to improve the quality and availability of employee data and provide a broad range of payroll and human resources services to UC locations.

- Inter-campus disaster recovery partnerships to ensure that IT systems are immediately recoverable in the case of a disaster.

- Multi-campus partnership (with UCOP support) to implement the Kuali Financial System (KFS), a non-proprietary higher education financial system.

- UCTrust, a federated identity management framework, developed to support secure UC systems access and business.

- Effort Reporting System, a UC-wide initiative to develop a system to effectively report effort on federal contracts and grants.

- A five-year IT strategic sourcing initiative designed to leverage procurement via systemwide IT contracts, resulting in more than $10M savings to UC departments annually.

The ITGC proposes that UC develop the blueprint for shared administrative and business systems and practices by:

- Adopting and promoting innovative shared service delivery models that address critical infrastructure challenges that could return significant financial benefits to the University while enhancing quality of service.

- Implementing business systems that exploit integrated technology architectures and are catalysts for the adoption and promotion of UC-wide standards and effective business processes.

Building Momentum

Leaders throughout the University are already engaged in work to advance these initiatives, including:

UC network infrastructure: UC network experts have been working closely with CENIC to develop the blueprint for next-generation networking capabilities to be deployed in the coming year by our regional network partner. Greater bandwidth and flexible service offerings will offer expanded opportunities to serve the research community. In August 2007, UC contracted with CENIC to develop fiber-optic connectivity for the UC Santa Cruz campus, the last of the UC campuses to benefit from fiber connections. UC locations continue to plan for the "last mile connectivity" required to bridge campus networks to the high-speed CENIC backbone network and to assess the costs of these last mile connections.

Partnerships with other educational segments and service providers in California continue to reveal new opportunities to leverage the University's investment in network infrastructure. The ability to provide telemedicine services to underserved rural communities is a prime example.

UC future data center infrastructure needs: A team of IT, energy, facilities and construction experts is working to articulate UC's current challenges related to skyrocketing power costs and constraints and the costs and inefficiencies of maintaining a highly decentralized UC data center computing infrastructure. A study will be initiated in early 2008 to document the current environment via key benchmarks and to propose both short-term cost-saving measures and longer-term data center consolidation alternatives.

UC research cyberinfrastructure: Research computing experts have been piloting high-performance computing models that allow researchers to share resources at lower cost and with greater energy efficiency. UCLA, UCI and UCSB have created the UC Grid prototype to illustrate the promise of a new model that is responsive to major UC problems due to power costs and space constraints on campus. All UC campuses have committed to connect to the current UC Grid pilot in order to continue to explore and refine future research cyberinfrastructure offerings.

At the direction of the Council of Vice Chancellors of Research, a steering group including high-performance computing experts, campus CIOs and systemwide research leadership has been convened to guide and oversee the development of cyberinfrastructure services to the UC research community.

UC teaching and learning technologies: Plans are under way for a UC-wide conference on teaching, learning and technology (June 2008), which, in part, is envisioned as a continuation of the discussion initiated by the ITGC's instructional technology work group about the educational opportunities of IT and the potential for UC-wide collaboration.

Although this report is the final work product of the IT Guidance Committee, it marks only the beginning of an ongoing effort to plan for and invest in IT across the University.

The UC-wide IT Leadership Council will provide a focal point on the campuses, medical centers and Lawrence Berkeley National Lab for the stewardship and oversight of the ITGC proposals. Crucial to the success of this governance body is committed involvement by UC leadership in periodic strategic IT planning in the future as requirements evolve over time and new proposals emerge for IT infrastructure and services that offer great opportunities across campuses.

It is clear that information technology will become ever more important to the advancement of UC's mission of teaching, research and public service. Funding requests are being prepared and plans being developed demonstrating that IT is an essential capital investment. This report suggests that the University elevate its commitment to IT, both by empowering UC IT leaders to move forward with these and emerging initiatives, and by dedicating adequate resources to succeed. The University of California of the future depends on it.

Appendix

MEMBERSHIP

ITGC SPONSOR & CHAIR: **Rory Hume, Provost, UCOP**

ITGC CO-COORDINATORS: **Daniel Greenstein**, *Vice Provost, Academic Information and Strategic Services, UCOP*

Kristine Hafner, *Associate Vice President & Chief Information Officer, IR&C, UCOP*

ITGC MEMBERS **Jim Davis,** *Chief Information Officer, UCLA*

David Kaplan, *Professor, Philosophy, UCLA*

Larry Merkley, *Chief Information Officer, UCSC*

David Messerschmitt, *Chair, UC Committee on Information Technology and Telecommunications Policy (2006-2007); Professor Emeritus, Electrical Engineering and Computer Sciences, UCB*

Gerry Munoff, *University Librarian, UCI*

John Oakley, *Professor, UCD Law School; Chair, Academic Senate (2006-2007)*

Steve Relyea, *Vice Chancellor, Business Affairs, UCSD*

Jim Sandoval, *Vice Chancellor, Student Affairs, UCR*

AnnaLee Saxenian, *Dean, School of Information, UCB*

Jonathan Showstack, *Assistant Vice Chancellor and Co-CIO, UCSF*

Eric Vermillion, *Associate Vice Chancellor, Finance, UCSF*

Michael Witherell, *Vice Chancellor, Research, UCSB*

Peter Yellowlees, *Director, Academic Information Systems, Medical School, UCD*

FOCUS AREAS/WORK GROUPS

Information about, and reports generated by, these work groups and one additional focus area can be found below.

ADVANCED NETWORKING SERVICES

Chair: Jack McCredie, CIO Emeritus ,UCB

UCOP staff: David Walker, Director, Advanced Technology, UCOP

Reports: http://www.universityofcalifornia.edu/itgc/focusareas/advnet/welcome.html

COMMON IT ARCHITECTURE

Chair: Rich Kogut, CIO, UCM

UCOP staff: David Walker

Reports: http://www.universityofcalifornia.edu/itgc/focusareas/comarch/welcome.html

HIGH PERFORMANCE RESEARCH COMPUTING

Chairs: Jim Davis, CIO, UCLA; and Chuck Rowley, CIO, UCR

UCOP staff: David Walker

Reports: http://www.universityofcalifornia.edu/itgc/focusareas/hpresearch/welcome.html

INSTRUCTIONAL TECHNOLOGY

Chair:	Ruth Sabean, Assistant Vice Provost and Director of Educational Technology, UCLA
UCOP staff:	Paula Murphy, Director, UC Teaching, Learning & technology Center, UCOP
Reports:	http://www.universityofcalifornia.edu/itgc/focusareas/edutech/welcome.html

STEWARDSHIP OF DIGITAL ASSETS

Chair:	Brian E.C. Schottlaender, University Librarian, UCSD
UCOP staff:	Gary Lawrence, Director of Systemwide Library Planning, and Connie Williams, Records Manager, UCOP
Reports:	http://www.universityofcalifornia.edu/itgc/focusareas/stewdig/welcome.html

IT IN STUDENT EXPERIENCE (Focus Area)

UCOP staff:	Paula Murphy
Reports:	http://www.universityofcalifornia.edu/itgc/focusareas/student/welcome.html

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Report Editors: Paula Murphy and David Walker, UCOP

TIMELINE

Launch the ITGC	Feb. 2006
Campus consultations	Summer 2006
Interim work group reports	Dec. 2006
Summary report to Provost	May 2007
Campus consultations	Summer 2007
Review and comment	Summer 2007
Final report to Provost	Dec. 2007
Comments from Academic Senate to ITLC	Early 2008

RESOURCES & MORE INFORMATION

ITGC web site: http://www.universityofcalifornia.edu/itgc/

Long-Range Guidance Team report: http://www.universityofcalifornia.edu/future/lrgt1106.pdf

Email: itgc@ucop.edu