Joint Action for Collective Benefit in Higher Education
Promising Prospects in the Cloud

Notes from the EDUCAUSE/NACUBO/Internet2
Task Force on Demand Aggregation

These notes are derived from a longer July 2010 report delivered by the Task Force to the
Boards of EDUCAUSE, NACUBO, and Internet2. This excerpt omits the specific
recommendations under consideration by those Boards.

I. Overview and Summary

EDUCAUSE, NACUBO, and Internet2 charged this task force “...to develop plans for a coordinating body
that will support aggregation of cloud demand and services for higher education.” We translated this
charge into three deceptively simple questions:

- Are there promising opportunities, especially involving “cloud” services, for colleges and
  universities to aggregate information-technology resources more efficiently across multiple
  campuses, thereby gaining economies of scale and/or better negotiating positions?

- If so, which opportunities are worth pursuing in the near future?

- What role should NACUBO, EDUCAUSE, Internet2, and other existing organizations play in
  exploiting these opportunities?

The task force comprises six members: Joanne Kossuth (Olin College of Engineering) and James Hilton
(University of Virginia), designated by EDUCAUSE; Fred Rogers (Carleton College) and Roger Bruszewski
(Millersville University), designated by the National Association of College and University Business
Officers (NACUBO); and Joe Freddoso (MCNC) and Shel Waggener (University of California at Berkeley),
designated by Internet2. The group was convened initially by Richard Katz and then led by Greg Jackson,
of EDUCAUSE. It benefited from work by two consultants, Phil Goldstein and Jerry Grochow.

The task force's charge was motivated by widespread interest in cloud provisioning. We define this as
obtaining services for campuses or users over the network from providers external to the institution (for
example, obtaining research-computing cycles from an outside provider rather than buying new servers)
or taking traditional on-campus based systems and applying cloud technologies to aggregate demand
across several campuses (for example, security camera monitoring could be done across several
campuses by one provider over the cloud).

Provision from the cloud is not new, of course: campuses have long relied on outside entities to build
computers, to develop and support administrative and personal-computer software, to provide long-
distance telephony, to maintain library cataloging data, and so on. Our charge was to consider not cloud
services per se, but rather how their rapid evolution might enable better aggregation and coordination
among colleges and universities.

Until recently campuses had little choice with regard to the core infrastructure of information
technology: data centers, server arrays, major applications, communal services such as email and
telephony, and support. Now high-performance networking, pioneered by higher education more than a
decade ago, has diminished the importance of physical location, virtual-machine environments have
diminished the importance of physical servers, and standardization has diminished the requirement for
extensive local support. As a result, opportunities for shared services have exploded. This has created a
daunting array of options for moving information technology to the cloud and for pooling resources,
while at the same time presenting significant risk of creating a new set of duplicated, inefficient, and
costly processes, both for higher education and for the sellers and providers of cloud services.
Traditionally each campus has fended for itself in working with outside providers. As a result, higher education has had little collective leverage dealing with major vendors. As cloud services and other outside provisioning consume a larger fraction of resources, it becomes more important that higher education not replicate the expensive one-off models of the past. Instead, we must find ways to consolidate buying power and secure economies of scale.

Our report starts with an outline, in Section II, of the different mechanisms higher education might use to aggregate demand, and the several layers of information technology that might be appropriate for aggregation. We then turn, in Section III, to several examples of demand aggregation in practice, and finally, in Section IV, to principles and next steps.

II. Mechanisms and Layers

“Demand aggregation”, in this report, means any set of activities through which colleges and universities work together to obtain resources more effectively than they would individually. We focused in our discussions on four principal mechanisms for aggregating information-technology demand:

- proceeding similarly by sharing wisdom,
- standardizing contract terms and conditions through umbrella agreements,
- combining purchases through brokered procurement, or
- joint provision through collectively owned entities.

There are myriad sub-variations and combinations of these, but we limit our discussion to the broad categories for the sake of clarity.

Sharing Wisdom

This is by far the most common mechanism for demand aggregation: sharing experiences and best practices among institutions is a particular strength of our industry and community. Sometimes this occurs informally, through online exchanges or at meetings such as the Consortium of Liberal Arts Colleges (CLAC) or Research University CIO Conclave (RUCC) – not to mention the annual meetings of EDUCAUSE, NACUBO, and Internet2. There are also many formal mechanisms, for example EDUCAUSE’s E-Live! webcasts and some of the reports from its Center for Applied Research, and many similar dissemination activities from NACUBO.

Although it seems strange to characterize sharing wisdom as demand aggregation, it has that effect: Institutions gradually come to approach similar choices in similar ways, thus reduce the effort required of both buyers and vendors, and so guide the market toward better products and pricing.

As we will illustrate below, there are opportunities for colleges and universities to share wisdom even more formally, by standardizing key documents such as RFPs and procurement terms.

Umbrella Agreements

These are also common. In many cases, an existing group – often a regional association such as the NorthEast Regional Computing Program (NERCOMP) or the Midwest Higher Education Compact (MHEC) – negotiates with a vendor to provide a specified blanket pricing or discounts, or perhaps special terms, to its members. Individual institutions then buy directly from the vendor under those negotiated terms.

In other cases, a vendor (usually a large and established one) presents some kind of special deal to a defined set of institutions, each of whose members does its own buying under the deal.

The problem with vendor-initiated umbrella agreements is that they are inevitably structured to the vendors’ advantage. Such agreements are subject to unpredictable modifications, and vendors can change them at will. The Microsoft Campus Agreement, for example, used to include far more software than it does today, yet its pricing remains about the same. The Cisco deep discount for NLR members
expired within a relatively short period. And Oracle’s special pricing and terms for higher education seem to change with each purchase. All tend to be radically altered as the result of corporate merger and acquisition activity within a consolidating higher education solutions marketplace.

Collective advocacy by higher education sometimes results in vendors providing umbrella pricing and terms, as was the case with the Microsoft Campus Agreement. However, unless pricing and terms are formalized in an agreement that binds the vendor – which usually requires, as quid pro quo, that higher education commit to a specified volume of purchases – they really do not constitute demand aggregation.

**Brokered Procurement**

In this case, one institution – or perhaps a regional or national association – purchases from a vendor on behalf of several institutions.

The differences between this and umbrella agreements are cash flow and in some cases distribution: the vendor deals with a brokering entity, not with individual institutions. The key distinction between this and collectively owned entities is that the broker generally adds no support, operations, or other unique value to what it procures on behalf of its consortium (other than hopefully lower cost structures to the seller in exchange for potentially lower price) for higher education consumers of the service.

**Collectively Owned Entities**

Under this approach, demand is aggregated through a separately incorporated entity that acts on behalf of its owner/members. In most cases the entity also provides some value directly – for example, Internet2 and National LambdaRail both not only buy networking capacity or services that they “resell” to their members, but also employ staff to manage networks, provide support, provide member services, manage conferences, and so forth.

In some cases the entity not only procures and enhances but also develops, supplies, and operates services itself. The Kuali and Sakai foundations are examples of this last form of demand aggregation, which in effect not only aggregates but meets demand.

**Delivered Service Layers**

Colleges and universities deploy information technology not for its own sake, but rather to satisfy academic, administrative, and community functional needs. It is useful to think of information technology as stacks, each of whose high-level layers rests on more fundamental (and often more shared) ones. A simple conception of the stack is this: Support helps users exploit functionality, functionality is provided by applications, applications run on hardware and software platforms, platforms are located within facilities, and facilities interconnect and provide access to users over networks.

Consider, as an example, a campus event calendar. Substantive and technical staff provide the support that helps schedulers to add events to the calendar and helps users to find those events, to display the relevant details and links, and perhaps to download information to a personal device or calendar. The event calendar’s functionality is the specific set of requests and reports it makes available to users. The application is the software that provides the functionality, organizing events into some kind of database and providing the appropriate windows entry points for event schedulers or users. The platform is the computing environment upon which the application runs – one or more servers, presumably, running appropriate operating systems and “middleware” such as web servers, databases, and identification mechanisms to authorize access. The platform is housed in a facility of some sort, perhaps a campus data center with appropriate power, cooling, security, backup, and monitoring. The facility provides access to users over the campus network – or, if the facility is elsewhere, over regional, national, or international networks.
At one time most campus IT services were provided by organizations entirely internal to the institution, and so distinctions among these different layers in the service “stack” were relatively unimportant in terms of who was providing the service. As technology has advanced, it is now possible to look to external or shared “cloud” facilities providers for some layers.

To manage sourcing appropriately, it is important to distinguish among layers – obtaining one’s *platforms* from the cloud, for example, is very different from obtaining one’s *functionality* from the cloud.

### III. Examples

Colleges and universities have frequently attempted to aggregate their demand for information technology, seeking to manage resources better and more efficiently. Some of these efforts have been successful, and some have not.

There are also historical examples of demand aggregation outside information technology. For example, *Commonfund* enables small nonprofits – including small colleges and universities – to pool their resources and obtain investment advice and management they could not otherwise afford. Similarly, *United Educators* enables over a thousand institutions to obtain insurance through collective risk-sharing that would cost far more commercially.

We focus here on a few examples that illustrate how IT demand aggregation has worked in higher education.

#### National and Regional Networking

Networking is the current poster child for formal and effective demand aggregation. Fifteen years ago, many campuses had sophisticated campus networks, but all but a few campuses relied on commercial connections to the outside Internet and to other campuses. As demand for inter-campus bandwidth grew, the cost and capabilities of commercial Internet providers proved inadequate. An expensive, awkward sprawl of one-off inter-campus leased connections began to grow.

The community realized early on that this approach to networking across higher education would not scale. At the now famous meeting in the basement of the O’Hare Hilton – the very hotel where our task force met – thirty campuses agreed to pool their inter-campus networking resources and to create a new entity, Internet2, to procure and manage high-performance inter-campus networking on their collective behalf.

Internet2 has been remarkably successful, growing rapidly to become the dominant interconnector of colleges and universities. Internet2’s approach did not satisfy all higher-education needs or other organizational considerations, however, and in due course other collective entities grew and evolved to complete the picture: regional optical networks, state networks, National LambdaRail, and the Quilt. In some cases these joint entities procure services from commercial providers, and in some cases they install and operate equipment themselves. In many of these cases, the groups or entities are partners (or competitors) in delivering services.

Today most networking among campuses is provided by these joint higher-education enterprises, and much commodity networking is provided through umbrella agreements or brokered procurement by them.

#### Software and Hardware Deals

These have taken two basic forms: special targeted deals offered by vendors to all or part of higher education, and umbrella agreements negotiated between higher-education associations and vendors. There are of course general discounts that higher education enjoys from many major vendors. Since
these discounts are essentially marketing efforts by vendors rather than demand aggregation by campuses, we do not include them here.

The most common examples of hardware and software deals are special pricing and/or terms negotiated by associations. The Midwest Higher Education Compact (MHEC), for example, has negotiated special pricing or discounts for its members with a broad array of vendors including Dell, Fujitsu, Oracle, HP, Novell, Oracle, VMWare, Xerox, Dell, Alcatel-Lucent, Enterasys, Mitel, and Juniper. Similarly, the NorthEast Regional Computing Program (NERCOMP) has deals with Adobe, Blackboard, Microsoft, and Parallels.

These deals tend to be quite successful for smaller institutions. They also benefit larger ones, but can do so counterproductively to the general good. The problem arises when larger institutions approach vendors themselves, pointing to an association’s deal as the starting point – that is, using it as a negotiating strategy to get an even better deal. This one-off negotiation dilutes the general deal’s appeal to the vendor, which is often predicated on simpler and more standard negotiations, and in due course the one-off efforts undercut the collective effort. Moreover, since the better “rogue” deals are often concealed behind non-disclosure agreements (NDAs), they are precisely antithetical to demand aggregation. Vendors themselves also support this activity by individually approaching institutions that they would like to as reference sites and providing additional extraordinary pricing, further motivating schools to pursue such deals. This points to a major challenge for demand aggregation in higher education: ensuring that participants work together in open and transparent fashion.

A somewhat different example is the Microsoft Campus Agreement, through which campuses can procure core Microsoft products such as Office and Windows based on the size of the institution rather than the number of copies distributed – that is, through a true site license.

For years Microsoft had refused to provide site licensing, insisting that campus buy through volume discounts (the “Select” agreement) and account in detail for distribution. Several campuses worked closely with Microsoft to develop a site-licensing plan that would not change overall spending, but would remove expensive and burdensome accounting requirements and eliminate internal software-piracy problems. The resulting Campus Agreement was far from perfect – for example, it had exit provisions that many campuses found intolerable, and its coverage shrunk over time – but it is a clear example of concerted action by campuses securing important concessions from vendors.

**Joint Development**

Joint-development efforts generate excitement, but also controversy. The controversy arises in part because joint development can have two very different motivators. Sometimes its appeal is intrinsic: that is, joint development is the only way to obtain a given application or function. But sometimes its appeal is competitive: that is, the joint development grows out of discontent with vendors’ terms, pricing, or practices.

An example of a project with intrinsic appeal and great success is uPortal – open-source software, jointly developed by myriad institutions through an organization called JASIG. The uPortal software underlies many campuses’ customizable Web portals, ranging from Cornell to the Chinese University of Hong Kong. There were commercial web-portal products before uPortal, but they were typically captive adjuncts to or parts of other applications, such as Blackboard or Banner. Most campuses wanted their portals to be more flexible and independent of other products, and the uPortal software was the result.

One especially interesting feature of uPortal is the role commercial entities play in its success. Although the software was developed jointly and is open source, several commercial firms have built successful businesses helping campus to install, configure, and even operate uPortal software. This has greatly eased the entry barrier for campuses considering uPortal. It is a model worth encouraging.
Another joint-development example, albeit one that has been adopted more slowly thus far, is the Shibboleth identity-management software developed within InCommon, a multi-campus organization affiliated with Internet2. Like uPortal, Shibboleth has direct appeal to higher education and, like uPortal, it can present implementation challenges. Adoption of Shibboleth appears to have been slowed for three reasons: it requires campuses to have identity management structures and business processes already in place (a potentially challenging proposition which can be difficult to implement); commercial partners to assist with implementation have been slower to emerge; and its justification tends to be more strategic in nature, focusing on simplifying future services rather than addressing pressing current challenges and so complicating business cases for the necessary resources.

The most compelling examples of joint development are the Sakai instructional management system and the Kuali suite of administrative applications for colleges and universities. Each has major commercial competitors, and so their appeal grows partly out of being an alternative to commercial vendors.

Sakai is both the older and the more widely deployed of the two efforts. Whether its success reflects the quality of the product or distaste for the major commercial provider is hotly debated. The product is highly modular and customizable, which gives it appeal, but this also makes it complicated to install and maintain, which has the opposite effect. Over 200 institutions now use Sakai, so it clearly plays an important role. Whether Sakai has aggregated or dispersed demand is less clear.

Kuali seeks to replicate Sakai’s success by creating a family of open-source financial, research-administration, student, and other administrative systems optimized for higher education – in contrast with commercial administrative systems, which in many cases are designed for industry.

Administrative systems are far more complicated than instructional-management systems, they have far more interactions with other internal and external systems, they are bound by myriad federal and other requirements, and they are often tailored to campus organizational and administrative idiosyncrasies. Moreover, a failure of administrative systems puts institutions at major risk, and the costs of migrating to a new system – however appealing the new one, and however distasteful the old – can be quite high.

Partly as a result of these obstacles, the adoption and production deployment of the larger, more complex Kuali software projects has been relatively slow. It is popular with the institutions that have implemented some of the early projects, but it is premature to say how successful an example of demand aggregation it will ultimately become for the broader community.

IV. Principles and Next Steps

**Principles**

Several assumptions and principles proved important to the Task Force’s work.

- All else being equal, it is best to seek initiatives that enhance the core of our enterprise – teaching, research, community service – but it is also important to streamline administration and other non-core activities so that resources can be reallocated to the core.

- Traditional colleges and universities are basically risk averse. Increasing risk – or moving from risks that are well understood to those that are not – rarely succeeds unless the transition is well understood, it is well suited to the institution’s risk profile (early adopter, late follower, etc.), and the benefits clearly justify it.

- Restricting choice or experimentation (and ultimately innovation) in the interest of standardization and efficiency rarely appeals to our communities. This is a fundamental obstacle to demand aggregation, albeit one that can be overcome if the stakes are high enough and communication is clear and open. Moreover, the obstacle may be easier to overcome for non-
core processes, systems, and tools – such as campus transportation scheduling or building environmental management – and the current economic reality may provide an opportunity to hone the priority areas for individualism.

- The higher-education community values individual control over privacy. This is not the same as valuing privacy *per se*, as the widespread popularity of social networking clearly illustrates. Initiatives that interfere with privacy choices rarely succeed; those that make a compelling case for individuals to change their choices do.

- We should prefer existing services to hypothetical ones, even in cases where the latter may be arguably better than the former, unless what exists simply is not good enough – to repeat the old saying, we should not let the perfect stand in the way of the good. Similarly, we should seek to eliminate redundancy and duplication that does not enhance functionality across our campuses, for example in areas such as business processes and identity management.

- We must consider the varying needs of different kinds of colleges and universities, and look to develop or procure tiered services that meet diverse needs. To this end, we should prefer initiatives that address widespread needs in the simplest possible fashion. These initiatives should feature the lowest barriers to access for the entire community, a least-common-denominator approach.

- We should prefer initiatives whose success or failure will become apparent soon, and make sure to implement evaluation mechanisms to tell the difference.

- Exit strategies are important. We should avoid aggregation opportunities and mechanisms that unduly constrain institutions’ future choices.

- Accessibility is important. We should make sure our joint efforts to not undercut our institutional commitments to eliminate unnecessary obstacles to access.

**Next Steps**

As is clear from the examples we cited, demand aggregation works when those participating agree to work collectively. Future initiatives will similarly succeed only if those participating commit to the common effort.

Higher education is not the driver of innovative practice in demand aggregation, but rather has been a laggard to commercial enterprises. Business models from Amazon, IBM, and similar cloud providers depend on competitors like Macy’s and Nordstrom to share data center space and overlying services. These retailers do not give up the individuality that differentiates them, but they do save billions by aggregating the compute cycles and data center space that are irrelevant to their uniqueness.

Demand aggregation often involves outside providers taking on functions currently housed on campus. A major example of this is identity management. For colleges and universities to work together with outside entities, it is critical that how we identify and describe membership in our community be standardized, and that we agree on mechanisms for securing, transmitting, and using that information. Mechanisms like Shibboleth and entities like InCommon are the right vehicles for achieving this, but we will need to move faster toward agreement, implementability, and adoption.

Our institutions insist on managing their own procurement. This means, in practice, that every time the community attempts to negotiate umbrella agreements, hundreds of attorneys and procurement officers attempt to modify the agreements. Collectively owned entities are one solution to this, but they are often overkill. We need to figure out how to act together without surrendering institutional authority.
During our discussion, we identified these and several other questions that will have to be addressed as demand aggregation services are implemented. Answering these questions will not be easy, but we believe this is necessary for the success of demand aggregation projects.

- How can we provide for the necessary on-going investments in services we collectively provide to ensure that service remain viable over a long period of time?
- What is the governance process for developing (and enforcing) operating rules to ensure common benefits?
- Will institutions join various service consortia individually, or via state, regional, or other associations?
- Can we develop common approaches to demonstrating the return on investment and the risk/reward to the satisfaction of our institutions?

Finally, we need to recognize a key fact: working together will be challenging. We need to define an appropriate role for our sponsoring organizations that will help their memberships to accomplish this consistently with their missions and goals. We need to understand the risks, to do whatever we can to minimize them without stifling collective action, and to insure ourselves against the inevitable failure of some of our efforts. If we do not risk failure, we cannot expect success.

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