Creating a Spatially Enabled Smart Campus

JOHN P. WILSON
Spatial Sciences Institute
University of Southern California
Email: jpwilson@usc.edu

The opportunity to conceive, design and build a smart campus seems close at hand for some and still far away for others. For the technology providers who want to sell innovative solutions for sensing, social networking and knowledge integration, the smart campus (much like the smart city) is close at hand. For campus service providers responsible for real estate acquisition, facilities management, transportation and parking services, student housing, food and beverage services, class and classroom scheduling and public safety, among others, the design, creation and realization of a smart campus may seem a long way off in the future. Faculty and students with competing agendas may also participate and will often occupy some ill-defined middle space by promoting one-off solutions that are tied to specific workflows (i.e. writing code, implementing new proprietary or open source solutions) or interests (i.e. building new technologies, evaluating existing technology solutions such as new building performance, or conducting human subjects research). The realization of a smart campus will in all likelihood require all of these individuals but the fundamental challenge is to prepare and build support for a single, comprehensive vision and a series of nimble and evolving technologies and workflows that can be deployed to accomplish this vision and incorporate new solutions as they become available.

This single vision and the accompanying workflows that can incrementally move the campus toward the desired goal would require support at the highest levels and would be best organized around a series of campus services and their intended recipients:

• Campus Services: These might include the scheduling of classrooms, allocation of research space, provision and staffing of libraries and other specialized teaching and research facilities, provision of housing for faculty, staff, and students living on or near campus, provision of health care facilities and services, provision of recreation facilities and programs, provision of a range of dining opportunities for faculty, staff, students and a variety of campus visitors, the construction of new buildings and maintenance of existing buildings and related infrastructure, the provision of a safe and productive environment, and the provision of maps, signs and other artifacts to facilitate access to the various facilities and services that the university provides.

• Campus Recipients (Participants): The intended recipients will include the current faculty, staff, and students as well as prospective faculty and students, current and potential collaborators, vendors, service providers, alumni, and a range of visitors (i.e. family and friends at commencement, seminar and workshop participants, and fans attending sporting events, concerts, plays, and festivals).
That said, the most important observation might be that things can get complicated very quickly. Taking my own university, the University of Southern California as an example, we have two main campuses (University Park and Health Sciences) located approximately 8 miles from one another to the southwest and northeast of downtown, an expanding suite of satellite operations (in Culver City and Marina del Ray, on Santa Catalina Island and using various locations in and near Downtown Los Angeles), a rapidly expanding series of hospitals and health clinics spread across the Los Angeles Metropolitan Region, and a variety of university-sponsored, university-affiliated (i.e., fraternities and sororities) and private student housing options located near and far from the aforementioned campus facilities. In addition, the University will soon break ground on the largest mixed-use project (office, residential, and retail) in the City of Los Angeles in the past quarter century. The vision for the University of Southern California smart campus then would need to include all of these facilities and many of the surrounding neighborhoods because campuses seldom have crisp borders and there is a constant flow of people and materials linking the campus to the larger city and region.

The implementation plan, on the other hand, would need to focus on a series of specific deliverables and milestones and preferably a clear set of priorities so that we can make measurable progress over time. Some of these services would be provided by the appropriate campus units (the CAD Services group within the USC Facility Management Services Department for example) and others would be provided by outside firms, such as the contractors hired to construct new buildings and related infrastructure (heating, cooling, electricity, water, gas, landscaping, etc.). These activities will inevitably generate a variety of spatial products, such as survey-grade data delineating property ownership and easements and building information models. Some university-sponsored projects will also engage non-profits and these projects may yield spatial data as well – an example would be USC’s recent partnership with the Advancement Project to characterize community assets and identify place-based research opportunities around the University Park campus. These activities and the accompanying spatial assets may afford new opportunities for research and teaching. For example, colleagues in the Viterbi School of Engineering have helped to build systems to: (1) track shuttles and report real-time results to customers with mobile phones; (2) improve the scanning and interpretation closed circuit video; and (3) model the performance of a series of recently constructed buildings using embedded sensor systems.

For our part, the faculty, staff, and students affiliated with the USC Spatial Sciences Institute have worked to build a series of collaborations that play to our strengths and advance our own vision of a spatially enabled smart campus. The following list describes the kinds of deliverables that will be provided:

- Installing and operating a community GPS base station at the Wrigley Marine Science Center on Catalina Island.
• Creating a series of map-based tours and story maps to document and promote both physical and virtual exploration of historically significant buildings and landmarks on the University Park campus.

• Creating a 3-D model of the University Park campus complete with photo-realistic outdoor and indoor facades and attributes depicting how interior and outdoor spaces are allocated and used, and then building a 3-D routing service and pushing it out to the Web and a variety of smart phone platforms.

• Creating a geocaching game to help new students explore the University Park campus prior to the first day of classes.

• Creating a series of customized tours for individual schools, departments, and other units and pushing these out to the Web and a variety of smart phone platforms.

The aforementioned examples barely scratch the surface and do little to illustrate how spatially enabled knowledge infrastructures and sensor networks, such as those connected with new buildings and closed circuit video systems, can be harnessed to promote spatially enabled smart campuses. There are many opportunities and most universities will lack the commitment and resources to pursue all of these opportunities simultaneously. This brings the discussion back full circle to the need for thought leadership and the articulation of a vision and accompanying priorities and workflows for building a state-of-the-art, spatially enabled smart campus over many years.