#HackFSM: Bootstrapping a Library Hackathon in Eight Short Weeks

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1. Introduction

From April 1-12, 2014, The Bancroft Library, the Research IT group in the Office of the CIO, and the School of Information at UC Berkeley held #HackFSM, a hackathon around the Free Speech Movement Digital Archive, as part of the *Digital Humanities @ Berkeley* initiative. The event brought together thirteen teams of UC Berkeley students to design a new interface for a subset of Bancroft's digital holdings on the Free Speech Movement.

This was the first time the Bancroft Library or Research IT had organized a hackathon, and the event went from idea to launch in approximately two months. The organizers benefited greatly from "Hackathon #1: Getting Started, Lessons Learned and Everything in Between", a white paper produced after the 2012 Alameda County Apps Challenge. That hackathon was in many respects a much larger and more ambitious undertaking than #HackFSM, and may give readers the impression that holding a hackathon necessarily requires many months of intensive preparation. We hope that this white paper provides a view of what a "minimal" hackathon can entail, from both the organizational and technical perspectives. It also addresses particular considerations for hackathons at universities, with a student audience.

2. Background

2.1 Hackathons on Campus

Hackathons have been growing in number and scale on the Berkeley campus. Student-targeted hackathons are often collaborations between student clubs (or institutions) and private sponsors. Working with APIs provided by sponsors, students often compete for significant cash or in-kind prizes by programming intensively for a 24 to 48 hour period. "Save the Day, Code for Good" Hackathon in March 2014, sponsored by Palantir, Salesforce, Redfin, EA, and Microsoft, which awarded iPad minis to first place winners, was organized by a student club that offers pro-bono tech consulting for local nonprofits. Hacking Health, a larger-scale collaboration between the Lester Center for Entrepreneurship and several pharmaceutical companies offered a total of $11,000 in cash prizes over three categories to teams working on healthcare apps. Other hackathon variations included "designathons" focused on graphic design for local businesses and 12 hour "hack jams" for beginners.
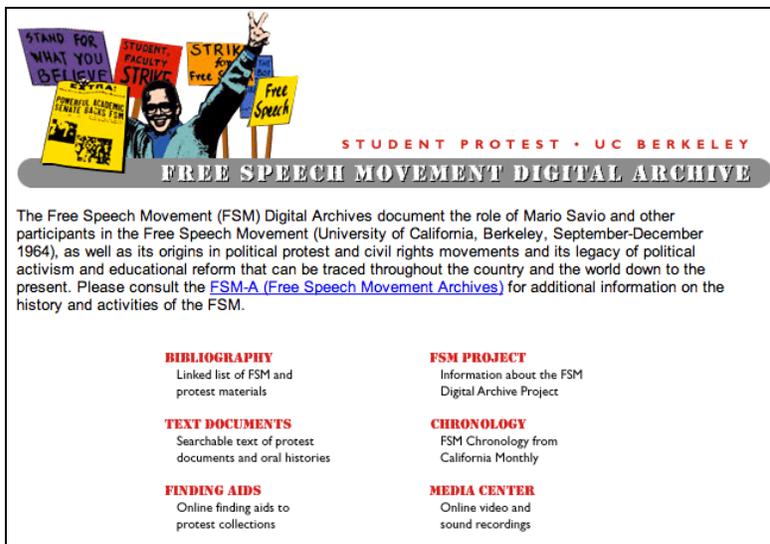
2.2 Digital Humanities at Berkeley

Between fall 2012 and spring 2014, the graduate student led digital humanities working group (sponsored by UC Berkeley's Townsend Center for the Humanities), the Digital Humanities @ Berkeley initiative (funded by the Office of the Dean of Arts and Humanities), and members of the UC Berkeley Library have organized events highlighting digital humanities-inflected research and pedagogy. Open to all members of the university community, these events have included short presentations by faculty members, poster sessions, and brief hands-on training around individual tools and methodologies. While the events have been fairly well attended, undergraduate students have been underrepresented. During planning for spring 2014 activities, the digital humanities working group suggested holding a hackathon, which would provide students with hands-on experience with digital humanities development.

2.3 The Free Speech Movement Digital Archive at the Bancroft Library

As discussions evolved, one member suggested focusing on The Free Speech Movement as an appealing, immediately recognizable subject of the hackathon. The Free Speech Movement is felt to be quintessentially "Berkeley", and while most students are aware of the movement (a popular cafe on campus is named in the movement's honor), it is not necessarily well understood by those students. The hackathon offered an opportunity to raise awareness of the subject and there was an available dataset to work with in the Bancroft Library's Free Speech Movement (FSM) digital archive.

The FSM digital archive includes materials that document the role of participants in the Free Speech Movement (University of California, Berkeley, September-December 1964) and its legacy of political activism and educational reform. Because of the uniqueness and local relevance of the collection, materials from the FSM digital archive were among the first content digitized and put online by the Bancroft Library in the 1990's. As a result, the FSM website now looks dated and lacks the kind of functionality that is found on newer sites. Built using an early online publishing tool, the site has been migrated several times over the years. It groups materials into broad categories that link to the digital archive materials at the California Digital Library's *Online Archive of California* and *Calisphere*. While it has been recognized that both the design and functionality of the site could benefit from improvement, staff and resources to create a new site have not been available.

To address these concerns, the planning group decide to challenge participants to design a new interface to the FSM digital archive. With the 50th anniversary of the FSM coming up in Fall 2014, the timing of the hackathon and the challenge to update the interface were even more appealing.

Working with a legacy digital archive and associated collections, however, presented a number of challenges that had to be overcome before the material could be made available to hackathon participants.

3. Technical Preparation

3.1 API Development

To achieve the goal of developing a new interface to the FSM digital archive, it was important to provide access to the metadata and content through an API (Application Programming Interface). The technology selected to power such an API was Apache Solr. Data-centric digital humanities and digital cultural heritage projects are increasingly providing API access to their materials (e.g. Europeana, Digital Public Library of America). While the #HackFSM hackathon was focused on developing a new FSM interface, the organizers hoped that the API developed for the hackathon might also be of use to scholars of U.S. history for research purposes after the hackathon was over. While the winning site has proven useful for a handful of researchers using the collection, little direct use of the Library's FSM API has been made since the hackathon. This may be due to lack of promotion about the availability of the API to other hackers and the fact that documentation about it is only contained in the FSM hackathon site. In future, we plan to promote the availability of similar APIs beyond the confines of the hackathon.

To develop the Library's FSM API, we initially proposed partnering with a central IT group that would write a custom API against the library's content management systems (more than one was involved). The library noted the undesirability of maintaining a one-off API solution, even for a limited period of time, and instead offered to provide access to an Apache Solr API where the collection is indexed.

Offering support for an API to collection information and digital content is a service being explored by many libraries. This proposal, therefore, was well timed considering the Library Systems Office was already looking at offering APIs as part of developing a new Digital Asset Management infrastructure for all digital content in the UC Berkeley libraries collection (currently 53 terabytes in holdings). Establishing a Solr index was therefore desirable but, as this was a pilot project, the library committed to supporting the Solr index for a limited term of 18 months.

3.2 Data Preparation

The data preparation, because it was based on legacy data, was a challenge. As outlined previously, the data had originally been created in the 1990s as part of an early digital archiving project. The legacy metadata and content files had been migrated over the ensuing years and were in different states of accessibility, and in different content management systems, when we began development of the Solr index. This required a number of separate processes to be applied to the data in order to bring it together into a single Solr index, including data normalization and transformation of the some values.

The short time frame we had to prepare for the hackathon, compounded by the difficulty in preparing the data, resulted in a rather bare bones data set. A number of desired augmentations to the data, such as changing the original prose date forms to machine readable, ISO8601 formatted dates, and removing legacy terms no longer in use, were not possible given the compressed timeframe.

Nonetheless, we were able to pull together the data (content files and metadata) about images and texts from the FSM collections into a single index. We had twelve fields retrievable via the FSM Solr API which were documented on the #HackFSM API details page. In addition, audio-visual materials digitized from UC Berkeley archival collections were also made available through an API provided by Pop Up Archive which allowed hackathon teams to bring in resources that had not been available in the previous FSM digital archive.

3.3 Swagger and API Access

In order to govern access to the Library's FSM API, we used a common-good campus service (no cost to users) called API Central, provided by UC Berkeley's Information Services and Technology department. The API Central service provides a proxy to the Solr API, and can be configured to require credentials in order to process an HTTP Request (credentials are values of app_id and app_key headers that are set in the HTTP Request Header).

Via IP address restriction, the Library limited Solr API access to the API Central servers and a small set of workstations used by Library IT staff. Once we provided some sample URLs by which the FSM API could be addressed, the API Central team quickly provided a test environment. API consumers send an HTTP request to the proxy server; the proxy server sends the request to the Library's Solr instance if valid credentials are provided in the request; and a response is returned to the user via the proxy server.

Once we confirmed that the proxy and credentials requirement were functioning properly, the API Central team created "interactive documentation" from the static documentation we had already published to describe the API to hackathon participants. The "interactive documentation" was created using the Swagger framework, and permits someone to type the values of API parameters into a web page (including the required credentials), then send the constructed request to the API by clicking a button and view the API's response. The documentation also provides a representation of the request as a user would issue it using the command-line tool *curl*. An simple example request that addresses the FSM API looks like this using *curl*:

```
curl -v -H "app_id:###" -H "app_key:###" -X GET
"https://apis.berkeley.edu/solr/fsm/select?q=Savio"
```

Mashery and Apigee are examples of commercial services that provide similar functionality to the Berkeley Campus' API Central service.

After the Hackathon was over, we added the FSM API to a set of web services that the campus' Research IT unit monitors using Nagios. This monitoring tests the API multiple times per hour, and notifies key staff if the API becomes unavailable.

4. Planning

4.1 Duration, Timing, Group Structure and Venue

Planning for the hackathon commenced shortly after the start of spring semester. Because we wanted to hold the hackathon that same semester, there was a very narrow range of possible dates that would ensure enough time for planning without conflicting with midterms, reading periods, and final exams.

Responding to issues raised in an [NPR piece](#) on diversity in hackathons, the planning group decided to have a twelve-day hackathon, with kick-off and judging events. The idea for the longer format was to be more inclusive of non-programmers, women, and allow more time for product development. It was felt this would also be useful given the requirements we intended to set up around group structure: groups could consist of up to four people, with at least one humanist (defined as an undergraduate student with a declared major in any departments in the Division of Arts & Humanities, or the History Department, or Linguistics; or, a graduate student affiliated with one of those departments) and one developer (defined as an undergraduate with a declared major in Electrical Engineering and Computer Sciences, Computer Science and Engineering, or Computer Science, or a graduate student affiliated with the Computer Science division or the School of Information). Twelve days would provide sufficient time for the groups to overcome the communication hurdles that would inevitably result from this group structure. Structuring groups in this way was important for us to be able to pitch the event as a "digital humanities" hackathon, and we believed that input from a humanities student (who would be more representative of the academic users of the FSM digital archive site) would lead to more effective interfaces than those designed by programmers alone.

The only viable twelve-day window late in the semester fell in such a way that the hackathon judging (scheduled for a Saturday) would fall on Cal Day, a public event on campus with hundreds of talks and activities highlighting Berkeley's many departments, programs, centers and organizations. We took advantage of this coincidence by submitting the hackathon judging itself as an event. Later, as we realized that judging would take more than the hour-and-a-half scheduled for the Cal Day event, we reframed the event as a public presentation of the winning entries.

While it would have been ideal to hold the public events in The Bancroft Library, because of limitations on food and drinks in the library, adequate room availability, and hours (they are not open evening or weekends when the events were scheduled), we decided to hold the public #HackFSM events in other venues. The Library administration offered the hackathon planners access to a 100+-person room in Doe Library that was about to undergo renovation (as the new [Berkeley Institute for Data Science](#) space) for the kick-off, and we partnered with the [UC Berkeley School of Information](#) to use two large rooms in their building (one for food and for teams to prepare, and the other for the actual presentations) for the closing event.

Finding a good space that allowed people to gather, eat pizza, and come and go freely throughout scheduled time was tricky to arrange but worked out well. We had to provide our own AV at the kick-off and work with our hosts on logistical issues, but overall it went smoothly.

4.3 Prizes and Funding
We looked at other hackathons that had been run at UC Berkeley, and spoke with a number of people who had participated in hackathons more broadly, and took note of the significant prizes typically offered at hackathons. We expected that simply having a prize would appeal to humanities students, who generally don't have the opportunity to compete in hackathons based on their knowledge of the humanities, but we wanted the hackathon to live up to the expectations of computer science students as well.

Initially, we planned on a $1000 prize for each of the (up to four) winning team members, and a $300 prize for each of the second-place team members. While the Dean of Arts and Humanities was supportive of the event as part of his Digital Humanities @ Berkeley initiative, he pointed out a university rule that we were not aware of, namely, that students on university financial aid who receive

a cash prize never receive the money, as it is simply deducted from their financial aid package. After exploring alternatives to a cash prize (such as gift cards), we concluded that the only way the prize would be equally applied to students with and without university financial aid would be if the prize was a physical object. We settled on MacBook Airs (retail value $999) for the first-place prize, and iPad Minis (retail value $299) for the second-place prize. These prizes were funded by the Digital Humanities @ Berkeley initiative.

The prizes constituted the vast majority of the event budget ($5285 out of a total of $6785), particularly since we were able to use the rooms for the kick-off and judging free of charge, due to the generosity of the Library and the School of Information. The *Computing and the Practice of History Initiative*, in the History Department, covered refreshments (pizza, soda and water, dessert, and fresh fruit) for the kick-off and judging, at a cost of approximately $750. Other expenses (e.g. poster and flyer printing, stickers, poster boards and markers, food, plates and utensils, and miscellaneous supplies) totalled another $900. Since we were able to secure $1000 from the Library and $500 from Research IT to support the event, we came in under budget, allowing us to direct the remaining funds towards supporting the hosting for the winning entries.

4.4 Mentors

We reached out to University IT staff, I-School faculty, Berkeley alumni, and individuals from local tech companies to serve as code mentors during the hackathon. We looked into multiple models for mentorship, including matching mentors to individual teams. We saw a risk in mentor "over-involvement" with their team, and prepared a set of mentor guidelines (see appendix 8.5) with the goal of laying out how mentors and teams should interact. Ultimately, the biggest challenge with matching mentors to groups was the difficulty in planning: we didn't know how many teams we would have until the kick-off. Instead, we made information (including contact information) about mentors available to participants, and made teams responsible for contacting mentors if they wished. We also invited the two curators for Bancroft's FSM collection to be "subject area mentors" to address questions about the history and materials in the collection.

In two cases, mentors made technical resources available to all participants to aid them in creating their applications. Mentors Bailey Smith and Anne Wootton, founders of the Pop Up Archive and alumnae of Berkeley's School of Information, provided students with an API that allowed students to add audio clips and automatically generated transcripts from collections in UC Berkeley's Ethnic Studies Library. Raymond Yee, a lecturer at the School of Information, provided an IPython notebook providing rich examples of API queries and result set processing.

4.5 Infrastructure

For planning, outreach, and hackathon management, we were able to get the functionality we needed using the free tier of various services, in addition to the website of the Digital Humanities @ Berkeley initiative.

4.5.1 Website

DH @ Berkeley staff quietly launched its website a few months prior to the hackathon planning period, and #HackFSM was the first public activity to draw people to the site. The DH @ Berkeley site was built using the Drupal content management system, and we had full administrative control over its

structure. This allowed us to easily create a page for the event with a custom URL (http://digitalhumanities.berkeley.edu/hackfsm), sub-pages for information about the event, and a custom sidebar menu that would enable easier navigation between them. Before we began to promote #HackFSM, the DH @ Berkeley site received 10 or fewer unique visitors per day. Once we began advertising, that number grew to 30-60 visitors, peaking at 165 the day of the kick-off, and 90 the day of the judging. While traffic dropped off after the event, it appears to have been successful in raising awareness of the site's existence; between April and August 2014, DH @ Berkeley had 10-20 viewers per day, on average. Organizers used the site to post reminders about dates, judging criteria, and other logistical information.

4.5.2 Registration
Participant registration was handled through Eventbrite. We created a number of custom questions for the registration form, and included boilerplate language from the university for the terms and conditions, as well as the assignment of photographic, motion picture, video and sound recording rights. (See appendix 8.1 for our registration form.)

4.5.3 Outreach
We used social media for reach out to student groups. The Bancroft Library created an "event" on its Facebook page for the hackathon. We used existing contacts with student groups and individuals with relevant interests as the basis for sending out Facebook invitations to the event. Facebook was not a particularly effective channel for collecting RSVP information; of the 25 people who indicated that they would attend, only five people were actual hackathon participants, and an additional five self-identified attendees were hackathon organizers.

We used Twitter to connect to potential mentors in industry, to promote the event beforehand, and to publicize it while it was taking place through live-tweeting. Much of the tweeting was done from the @DHBerkeley and @bancroftlibrary accounts, but mentor contacts and follow-up were handled through individual staff accounts.

4.5.4 Participant communication
During the hacking period, students, mentors, and event organizers communicated via Piazza, a free platform that offers a course-based message board, commonly used in STEM courses at UC Berkeley. We created a "class" (with an imaginary course number) for the event, enrolled organizers as "instructors", mentors as "TAs", and invited participants to enroll as "students". Piazza allowed participants to post questions (public or private) that could be answered by mentors, event organizers, or other participants. As organizers, we also used Piazza to post announcements, and the mentors took advantage of the platform to post related resources. Piazza has a feature specifically designed for helping students self-organize into groups, and we enabled this in order to help incomplete teams find additional members. See section 5.2 for additional details on how Piazza was used during the hackathon.

4.5.5 Project submission and scoring
We used Google Drive forms to develop the form that teams would use to submit their project to the technical judges (see section 5.3 and appendix 8.7 for details). The technical judges entered their scores directly into a judging spreadsheet on Google Drive sheets. While the presentation judges prepared

their scores on paper, those scores were entered into another Google Drive sheet that provided the proper weighting for each criterion, and tabulated the final ranking.

4.6 Publicity

We began doing outreach and publicity for the event as soon as we finalized the prizes on March 10th. We created a set of pages related to the hackathon on the DH @ Berkeley website, and tweeted about it on a regular basis from the DH @ Berkeley Twitter account. On March 12th and March 18th, we put up posters around campus. Putting up additional posters during spring break (immediately after the most prominent display boards had been cleared) gave us an advantage in the highly competitive poster environment, but the posters were still only effective for a few days before they were covered over. As mentioned above, we created a Facebook event for the hackathon as part of the Bancroft Library's Facebook page. Word of mouth, independent of any technical platform, proved to be fairly effective. We reached out to a number of relevant student groups (such as Hackers @ Berkeley, Innovative Design, and the Web Design DeCal) and asked them to spread the word to their members via social media and email lists.

Working through a student design club, we were able to find an undergraduate student who donated design services to the competition. Working from a sketch provided by a staff member, the student created a logo as a crisp, scalable vector graphic in Adobe Illustrator that could be used on printed and digital promotional materials of various sizes. These materials included digital banners optimized for Facebook and Twitter, letter sized flyers, and tabloid sized posters. 200 3" x 3" die-cut stickers featuring the HackFSM logo were ordered from StickerMule.com approximately three weeks prior to the event.

4.7 Registration

We opened registration on March 11th, shortly after we launched the website and began our publicity push. We used the free-tier Eventbrite service to collect registration information. We did not have a good sense for what kinds of students (e.g. majors, skills, interests) might participate in the hackathon, and we wanted to collect this information in order to help us better target outreach efforts for future events. Due to university restrictions on sensitive data, we did not ask for information about gender or race.

The registration form additionally provided an opportunity to have participants agree to the hackathon terms and conditions, and agree to a standard release form. Hackathon terms and conditions were adapted from terms and conditions provided by Blueprint, a student organization pairing student developers and designers with nonprofits, for their Social Good hackathon. Additionally, terms and conditions included a release that would allow us to take photographs at the event and use them in the future. (See appendix 8.1 for the registration form.)

The Alameda County hackathon that we looked to as a model had a nominal registration fee as a way to encourage those who registered to actually participate, as space was limited. We considered doing the same, but rejected the idea in light of the administrative challenges involved in collecting money (even with Eventbrite providing the infrastructure), as well as the risk of alienating students with limited means. Due to space and time considerations, we intended to cap registration at 100 students, or 20 teams. Having spent some time thinking about how to handle having too many registrants, we began to

worry when not a single student had registered after a few days—so much so that we revised the terms and conditions to state that "a minimum of three teams must participate for prizes to be awarded."

These fears proved to be unwarranted; registration started to pick up by March 31st and we ended up with 50 registrations before the kick-off (including some invalid registrations, such as mentors who mistakenly registered as participants). Future event organizers should take note that they can and should create different type of event tickets, such as participant, mentor, and spectator. A total of 6 people registered at the kick-off itself, and 3 additional people registered after the kick-off.

5. Hackathon

5.1 Kick-off event

The kick-off event for #HackFSM was held April 1st from 4-8 PM on the Tuesday after students returned from spring break. We intended for attendance to be mandatory for at least one member of each team, as part of the purpose for the kick-off was to officially register teams and assign teams an API key. In practice, some flexibility was necessary.

The same evening as our kick-off, Berkeley experienced its first heavy rainstorm in over a year, which prevented some students from attending. There were also groups that formed after the kick-off; the last group received its API key nine days after the kick off event. Each late-forming team explicitly acknowledged that they were choosing to participate despite having less time than groups that formed at the kick-off.

The space for the kick-off event was arranged with a check-in table by the entrance, with two laptops. The first laptop was used by the organizers to check in students who had previously registered; the second was made available to those who had not yet registered, so they could fill out the registration form. Students were given event swag (a vinyl sticker with the HackFSM logo, and a reusable water bottle donated by the I Heart Water campaign at the University Health Services), and directed towards chairs set up for the presentation.

The kick-off was opened by Mary Elings, Head of Digital Collections at The Bancroft Library. She introduced the planning committee and important guests, thanked our supporters, went over the agenda for the evening, and then gave a brief history of the FSM Digital Archive and Bancroft's involvement in digital humanities projects dating back to the early 1990s.

Felicia Viator, a visiting lecturer and recent PhD in UC Berkeley's History Department in American History, was the featured speaker for the event. She gave an overview of the Free Speech Movement, targeted to a general audience. For many students, this was their first exposure to the Free Speech Movement beyond a brief mention in campus tours and informational plaques in the Free Speech Movement cafe in the undergraduate library.

Quinn Dombrowski, the Digital Humanities Coordinator in the Research IT unit in the Office of the CIO presented on the goals and guidelines of the hackathon, including final products, judging criteria, hackathon rules (as laid out in appendix 8.3). She also emphasized the importance of teamwork and creativity in addressing humanists' research needs and improving access to the digital archive.

Camille Villa, a Digital Research Assistant in Research IT and a senior in the History Department at Berkeley, showed how other archives have presented their content in ways that facilitate humanistic research, to provide some concrete examples that exemplify the somewhat-abstract goals of the hackathon.

After the presentations, we handed out API keys to groups that were already formed, and helped introduce students to one another until they were able to create a team that met the hackathon requirements (i.e. containing at least one humanities major, and at least one developer.) Humanities majors were the limiting factor in team formation, as many more developers than humanities students registered as participants.

The time allowed after presentations was used by teams to start hacking, get to know one another, and ask questions of the mentors and organizers. We allowed people to stay in the space until 8 pm, but most left soon after the APIs were handed out.

5.2 Hacking Period

During the hacking period, students were encouraged to make use of physical collaboration space provided by the D-Lab, a UC Berkeley center that provides cross-disciplinary resources, training and other infrastructure needs.

Though participants only posted a few technical questions, Piazza proved an effective means to communicate answers to all participants at once, maintaining a 'level playing field' for the competitive aspect of #HackFSM. Two interesting technical questions were:

1. A query whether deployment in Google App Engine would be sufficient for deployment. The answer given: working deployment instructions for a standalone server or virtual server were required, but for demonstration purposes Google App Engine was fine.
2. Whether a hackathon entry could be built atop a data dump (as opposed to live-querying of the API). This question threw us a little bit, because we hadn't considered it beforehand. Ultimately, we answered that live-querying was preferred, but that an implementation that did *not* assume a static data set -- e.g., a data store for which automated updating of changes to the API's underlying data was implemented -- would be judged more favorably than one that assumed the data would remain static.

Though mentors were present at the hackathon launch, via Piazza during the event, and at the closing event, participants did not make extensive use of their expertise. We determined that this probably had to do with the fact that each team included one or more Computer Science students, and the teams chose technical frameworks with which those students were familiar. However, we identified a number of steps we could have taken that might have encouraged more interaction between mentors and participants:

- introduction of mentors to participants at the launch event (as opposed to simply announcing their presence and availability);
- assignment of specific mentor(s) to each team;
- encouraging teams to request private mentor contact(s) via Piazza or other communication mechanisms;

- outlining circumstances in which a team might prefer to contact a mentor as opposed to using the online forum provided via Piazza.

5.3 Judging Day

5.3.1 Hacking time
Between 9 AM and 12 PM on Saturday, April 12, 2014, the School of Information provided space in one of its classrooms for last-minute hacking. We provided coffee and a light breakfast. Participation in the morning hacking session was optional, but more than half the teams came for at least some of this time.

5.3.2 Project submission
All submissions had to turned in by 12 PM to be eligible for judging. The submission process involved filling out a web-based form (see appendix 8.8) consisting of:
- a URL for the project code
- a list of technical dependencies (languages, libraries, frameworks and platforms)
- an email address for the group's primary technical contact, in case the technical judges had questions
- name(s) of the team members who would present the project
- a brief description of how each team member contributed to the project
- an affirmation that the submission complied with the Berkeley Honor Code

At 11:50 AM, we sent out an email to all participants listing the presentation order, which we had determined using a random number generator. At that point, one team (that had not been present at the morning hack session) emailed us to say that they were dropping out of the contest. A second team failed to appear for the judging or submit anything, leaving 8 of the original 10 teams in the running.

Lunch was delivered at noon, and the participants brought food with them as they moved to the ISchool presentation classroom, which was down the hall from the classroom where the morning hacking took place.

5.3.3 Presentations
Before each presentation, we invited the team members to pose for a group photo in front of a backdrop made of extra promotional posters for the hackathon. These photos were used after the hackathon to illustrate the diversity of the participants and groups.

The presentations were judged by Erik Mitchell, Associate University Librarian, Digital Initiatives and Collaborative Services; Kathryn Neal, Associate University Archivist in the Bancroft Special Collections library and one of the curators of the Free Speech Movement collection; and Cathryn Carson, Associate Dean for Social Science and interim Director of the D-Lab, a hub of activity around data-driven social science and digital humanities research.

Teams had 7 minutes to present their project, with 3 minutes available for questions from the judges. Two minutes were allotted for transitioning between groups. The presentation schedule was followed only loosely; having two groups drop out left gaps in the schedule, and teams volunteered to present early to avoid a 10-minute wait.

With one exception, all teams presented from laptops connected to the room's projection system. While we did provide a variety of typical adapters to connect devices to the projection system, one team member had a laptop with an extremely obscure adapter that itself wasn't compatible with the projection system; she presented directly from her laptop, positioned in front of the judges.

5.3.4 Presentation judging
Presentations were given a score between 1 and 5 on each of the following criteria, which were weighted as indicated in parentheses:
- (5%) Audience: has the team identified the intended users of the interface?
- (5%) Research question / area of inquiry: has the team identified what the users are trying to do and what they're looking for in the FSM archive?
- (5%) Applicability of interface: has the team explained how their interface addresses the above?
- (15%) Research / inquiry effectiveness: how well does the interface facilitate addressing the identified research questions or area of inquiry?
- (15%) Is the research question or area of inquiry compelling from a humanities / library perspective?
- (10%) Is it visually appealing?
- (15%) Does it provide users with a number, variety, and/or sequence of options or steps for issuing and refining queries appropriate to the intended use?
- Did it pass the WAVE accessibility test? (**yes/no** - required to "win")
- Does the interface meet Contest Requirements that it not be indecent, defamatory, in obvious bad taste, or disrespectful in any way? (**yes/no** - required to "win")

We felt that accessibility was an essential trait for a winning entry, and wanted to encourage all participants to keep accessibility in mind when developing their project. This was both a matter of good practice, and liability for the university, if it chose to deploy the winning entries. All presenters were required to run the WAVE Web Accessibility Tool as part of their presentation, using the Firefox extension if the site was deployed locally (all but one team used this approach), and either the Firefox extension or the web-based test if the site was deployed on a public server. Projects were required to pass the test with no errors (warnings were dispreferred but acceptable) to be eligible for a prize. Only one team-- the team that formed late in the week of the hackathon-- failed the WAVE test. Luckily, that team's overall score would not have qualified them for a prize, regardless of the WAVE test.

Both the presentation and technical judging criteria, and their weighting, were distributed to the hackathon participants during the week, so they could tailor their presentations accordingly.

5.3.5 Technical judging
The technical judging was done by Harrison Dekker from the Doe Library Data Lab and Min Ragan-Kelley from the IPython team. They met in the hacking room to go over their evaluation of the code while everyone else watched the presentations. Technical judges scored entries on the following criteria:
- (10%) Does the interface use the API to assure that data presented is current?
- (5%) Does the interface require complex or unusual dependencies (platforms, libraries, ancillary technologies)?

- (5%) Does the code suggest that the interface will consume appropriate levels of deployment server CPU, memory, and network resources; and of server-side API resources?
- (5%) Is code appropriately structured, and commented and/or documented to a readable degree?
- (5%) Are steps necessary to deploy the interface and its dependencies, however complex or trivial, documented and cited so that a person with system administration skills but who is only marginally familiar with the technologies used can efficiently review and execute those steps?
- (y/n) Does the interface use any proprietary platform or programming language? If yes, please describe in notes (HackFSM coordinators may wish to consult further).

5.3.6 Announcing winners and public presentation

After the last presentation, we gathered all the scores from the technical and presentation judges and added them to a master spreadsheet (using Google sheets). There were clear first- and second-place winners. We announced the winners, and informed non-winning groups that they could contact us if they wanted to see their scores (aggregated by category, so as not to reveal individual judges' scores) and any feedback; two groups chose to do so.

5.3.7 Public presentations

Because the judging day coincided with an all-day event that opened the campus to the public by providing a series of events highlighting interesting organizations, programs and activities at UC Berkeley (Cal Day), we included a public presentation of the winning hackathon entries on our schedule. Attendance was modest with people coming in and out throughout the day, but the University Librarian, a representative from the campus news office, and members of the Free Speech Movement were present. After each winning team presented their entry, they were given an award certificate and a "vintage" commemorative button from the 40th anniversary of the Free Speech Movement. The larger prizes would take time to order through the university's official supply channels; see section 6.3 for details.

6. Post-hack

6.1 Publicity

As the first interdisciplinary hackathon on the UC Berkeley campus, this event was big news. The collaboration between RIT/Digital Humanities @ Berkeley and the Bancroft Library utilizing unique digital research collections about the FSM was also notable. A writer from the Communications and Public Affairs office was present at the events, as was a student writer from the Daily Californian, the student newspaper. Several articles and blog posts about the event were written:

- UC Berkeley History Collection News
- Daily Californian
- UC Berkeley iNews
- Fiat Lux
- Bancroft Digital Collections Blog

In addition, #HackFSM appeared on the front page of the main UC Berkeley website.

From late February 2014 through Fall 2014, there has been activity on Twitter about the hackathon (#HackFSM) from interested parties locally and across the country, though most of the activity came from the organizers the event. Organizers communicated information and requests to the community using social media; primarily Twitter, Facebook, and posting images on Flickr, and made an effort to document the events, participants, and activities through regular posts and status updates.

6.2 Student follow-up

One of the goals in of our follow up was to reach out to student participants to ask them about the process and their interest in participating. To that end, we asked the students to fill out a survey using a simple online survey tool from SurveyMonkey.com. We asked participants about a number of factors, such as what motivated them to participate, what they thought of the format, what worked and what didn't, etc.

The results showed some interesting trends. In terms of what motivated students to participate, many said they were drawn by the interesting collections, curiosity, a desire to build something useful, and, of course, the prizes. Several commented on wanting more clarity about the desired outcomes, which also came out during the kick-off event; perhaps more than anything else, this indicates a desire to narrow the parameters of their end product. Students were evenly split on what they thought of the extended twelve day format. Half felt it was too long, while the rest liked having more time to more fully develop their ideas and because it was "less stressful."

Overall, students liked the data set and enjoyed learning about the FSM as well as having the closing event on Cal Day. Things they would change included holding the events after class hours so they could better make use of mentors and librarians and having more discrete, usable, and cleaner data, such as ISO8601 dates, spatial coordinates, named entities, etc.

In terms of working with team members from other disciplines, while a small number found it had no value, the majority felt it made their interface more user friendly and benefitted their team to have different perspectives; some commented that it made things more "fun." Finally, the students were very interested in working the digital special collections and looked forward to future opportunities to hack on the unique materials housed in campus libraries, archives and museums.

We also invited students to a follow-up lunch to talk with them about the experience. About 10 students took us up on the offer and talked casually about the event. Their comments largely mirror what was said in the survey responses, but one comment that stood out was from one of the computer science students. He said that prizes were nice but that a good challenge and interesting content were more important to him. He noted that having his product put up on the library's site would actually be reward enough, as it would be something that he could point to on his resume. While not all students might agree with this assessment, it was surprising to us. It was encouraging to know that the historical content was a draw for the hackers and that showcasing their work was a significant benefit of participation.

6.3 Prizes

The process of acquiring prizes proved to be far more complicated than we anticipated; for two weeks after the hackathon, it was unclear whether we would be able to fulfill our prize obligation to the first-place team. As described in section 4.3, our choice of prizes was influenced by university policies.

On the day of the hackathon kick-off, we began to hear concerns about the first-place prizes, due to a university regulation (BFB-G-42) that limits the value of gifts presented to non-employees to $600[1]. Procurement staff from two of the three sponsoring organizations felt that the regulation applied in this case; the third organization disagreed, but was unwilling to place a procurement order on behalf of the other two. Complicating matters further, the members of the winning team requested a substitution of a cash prize for the laptop; as none of them were receiving university-provided financial aid, the concerns that steered us away from cash prizes did not apply. Ultimately, we applied to the University Controller for an exception to BFB-G-42, with the aim of awarding cash prizes. After consulting with us about the details of the fund that would pay for the prizes, legal staff about the substitution of a cash prize, and with the director of financial aid, staff in the Controller's office decided that BFB-G-42 did not apply because the prize would be better processed as a "scholarship". While this resolved the matter for three of the four students, there was an additional 2-month delay for the fourth student, due to a mix-up over who would set her up with the necessary account in the tax accounting system for foreign nationals, as she had not previously held a campus job or received a university scholarship.

While these details are specific to UC Berkeley, we strongly recommend that anyone interested in hosting a hackathon with prizes -- particularly, with large prizes -- consult with their local procurement and/or payment processing staff before announcing the prizes, in order to address any issues with local rules and restrictions.

6.4 Maintaining winning sites

After the hackathon concluded, the question of how to maintain the winning sites posed interesting challenges. We were given the code for each site and, in fact, the first place winning site had deployed their site as part of their presentation, making it easy to share it with anyone who was interested. Ideally, however, we wanted both winning sites hosted on library servers; something that the students expressed as desirable for their resumes.

After some time working through whether the Library or Research IT would support this effort, the winning entry was ultimately hosted on a local library server, with a plan to support this deployment until November 2015.

The decision to host on Library servers instead of Research IT's was largely based on the hosting and maintenance costs that came with putting it up on Research IT's servers. These costs included instantiating a Virtual Machine for both the first (Python) and second place (Ruby on Rails) sites, storage, automated testing, updates and/or patches of software, monitoring and assessment of security breaches, and consultation services, as needed.

These costs would have been out of pocket for the Library and so it was decided that the Library would take on the hosting and, considering the sites are using a library supported API, it made sense to try to support this work in the Library and have the Library bears those costs for as long as the site remains viable. The Bancroft created a #HackFSM digital collection page that points to the winning site. We are hoping to identify funding and resources to deploy the second place site, an implementation build on the Ruby on Rails framework; as well as to maintain these sites beyond November 2015.

The sites rely on both access to the API and the API Central proxy service to remain viable. As noted in Section 3.3, above, we did add the FSM API to a set of web services that the campus's Research IT unit

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[1] The full policy description can be found here: http://policy.ucop.edu/doc/3420354/BFB-G-42

monitors using Nagios. We were highly motivated to implement this monitoring when the API Central proxy stopped accepting application keys, and was unavailable during a period of high interest and publicity surrounding the FSM, as the movement's 50th anniversary approached. The proxy was easily corrected, and the Nagios monitoring -- which tests the API multiple times per hour, and notifies key staff if the API becomes unavailable -- will quickly resolve any future incidents of this kind.

As was expressed by the student participants and concurred by organizers, presenting the prize winning entries online for others to see is useful to the institutions supporting these types of events, as well as the the participants in them, as the "products" of this endeavor. While these products may be only exploratory and may not measure up as "production" level systems, they can serve as useful examples of the types of work that can be created on top of the library data and the diversity of approaches that can be taken with a single set of data. Having them online means that the institution can point to them as a viable outcome and the participants can put them on their resume as examples of their work.

7. Conclusion

The #HackFSM hackathon was a great experience for the library. Bancroft has been digitizing historic, archival materials since the early 1990s, and it has been exciting to explore new approaches to working with these digital collections and see the level of interest they generate. One of the most positive outcomes for the library was to learn that students are excited about working with digital historical collections and that an interesting challenge is a central motivation for their participation. So, if we give them something interesting to work on and with (and maybe a good prize or two), they will come.

The hackathon also served as a valuable opportunity for groups in very different areas of the university, with different priorities and organizational cultures, to work together towards a shared vision. There were areas of administrative overlap, particularly between the Library and Research IT groups, and clearly defining roles and responsibilities was essential. #HackFSM was a highly collaborative and interdisciplinary effort, made possible by the participation of the Library Systems Office, Library Administration, BIDS, the School of Information, Arts & Humanities Division, Social Sciences, and the students from various disciplines, in addition to the Bancroft Library and Research IT. The relationships formed through participating in this hackathon have continued to benefit campus through the development of new collaborative initiatives.

They say that imitation is the sincerest form of flattery, and the HackTheHearst hackathon, which launched September 10, 2014, was modelled in large part on our effort. We anticipate that it won't be the last hackathon that builds upon the work begun by #HackFSM.

8.   Appendices

8.1 Registration Form

First Name
Last Name
Email Address

Are you a currently enrolled (Spring 2014) UC Berkeley student?
Yes
No (Sorry, #HackFSM is for currently-registered students only.)

Currently studying:
Humanities
Computer science
Other

Major / Department

Anticipated graduation

What type of skills do you feel you can contribute to a team?
Programming
Design
User experience
Digital archive expertise
Research
Use cases / humanities background

For programmers: What languages are you comfortable programming in?
Python
Ruby
Java
JavaScript
C++
PHP
HTML / CSS
Other

What type of skills would you like to develop through this project?

Programming
Design
User experience
Digital archive experience
Research
Use case development
Other (Please describe)

Have you already formed a team? (Participants who aren't already part of a team will have the opportunity to form a team at the kick-off event.)
Yes → List the names of your team members. NOTE: All team members must also register individually.
No

What topics would you most like to learn about through this event?
Professional experience
Digital humanities experience
Archival experience
Building an interface for a digital archive
Learning about the Free Speech Movement
Other (Please describe)

Do you have any general questions about the logistics of the event that is not answered on the website (http://digitalhumanities.berkeley.edu)?

How did you hear about this event?

Have you ever participated in a similar event?
Yes → Name of event, date and location
No

Do you have any accessibility needs in addition to ADA compliance facilities?

By registering for this event, you are agreeing to the following terms and conditions (see appendix 8.2.)

Thanks for signing up! If you have not yet formed a team, you can introduce yourself and find a team by enrolling in our Piazza hackathon page below:

https://piazza.com/berkeley/spring2014/hackfsm1964/home

8.2 Terms and Conditions

During the registration process, all team members must agree to the following terms and conditions (regarding use of code developed for the event, granting Bancroft Library and the Regents permission to use photo and name for core service, promotional or marketing purposes, etc.)

Terms and conditions

The Bancroft Library reserves the right to cancel, suspend, and/or modify the HackFSM events or any part of it for any time and for any reason, in its sole discretion. A minimum of three teams must participate for prizes to be awarded. If no entries fulfill the judging criteria to the satisfaction of the panel of judges, prizes may not be awarded. Participant grants the Bancroft Library the license to use, reproduce, distribute, modify, and publicly perform and display entries, for core service, promotional or marketing purposes of the Bancroft Library and UC Regents and its services, as long as it does not infringe upon any third party's intellectual property rights. Participants grant permission to the Bancroft Library and UC Regents the right to use the participant's name, picture, likeness, voice, biographical information, and statements as part of or related to the entry, for advertising, trade, publicity, and

promotional purposes without additional compensation, in all media including but not limited to Internet and World Wide Web, without additional notice to, review, or approval by participant. Acceptance of any prize signifies each winner's acknowledgement and agreement that the Bancroft Library shall not be obligated to use the entry. The Bancroft Library is not liable for any disputes between participants that arise before, during or after the HackFSM events. By registering for, participating in, or submitting an entry for the HackFSM events, participants agree to these terms and conditions which are final and binding in all respects.

8.2.1 Assignment of photographic, motion picture, video and sound recording rights

I hereby authorize THE REGENTS OF THE UNIVERSITY OF CALIFORNIA (the "University") and its officers, agents, and employees, to photograph, film, or videotape me.

I understand that any photograph, sound recording, motion picture, or video taken of me under this assignment is for the purpose of collecting and/or representing factual information in the interest of serving the University of California's mission of research, education, and public service, and for promoting the public good.

I hereby assign to the University all rights, title, and interest, including copyright, in and to any and all such photographs, sound recordings, motion pictures, or videos, and I hereby irrevocably authorize the University, its officers, agents, and employees, without limitation, to reproduce, copy, sell, exhibit, publish, or distribute any and all such photographs, sound recordings, motion pictures, or videos in perpetuity for the purposes expressed above.

I further release and forever discharge the University, its officers, agents, and employees from any and all claims and demands arising out of or in connection with the use of said photographs, sound recordings, motion pictures, or videos, including but not limited to any and all claims for invasion of privacy, defamation, or infringement of copyright.

I have read and understood the provisions of this agreement, and understand that I am free to obtain advice from legal counsel of my choice, at my expense, to interpret these provisions. By submitting the registration form, I acknowledge that I have freely and voluntarily entered into this agreement.

8.3 Contest Requirements

The goal of the hackathon is to develop a compelling user interface for the digital images and texts related to the Free Speech Movement that the Bancroft Library is making available through an API. This user interface should allow users to pursue real research questions, and engage with the material in new ways. Each group will present their project before a panel of judges on Saturday, April 12. The winning group will present their project before a public audience later that day as part of Cal Day (see the event schedule for details).

The following requirements and guidelines apply:

Entries must

- increase online access to the content in the FSM digital archive.
- be based on the API for the FSM digital archive.
- use any non-proprietary platform or programming language (e.g. no ASP.NET).
- be finished or submitted "as is" by the end of the coding period:
- not be indecent, defamatory, in obvious bad taste, or disrespectful in any way.
- comply with campus security and accessibility policies.
  - Here are some tips for web accessibility
  - The winning entry must generate no errors when run against the WAVE Web Accessibility Tool
  - If an entry is selected for deployment, it will undergo a security review using AppScan

Teams must

- be made up of currently registered (spring 2014) students at UC Berkeley.
- contain at least 1 humanist and at least 1 computer science student.
  - A "humanist" is defined here as an undergraduate student with a declared major in any departments in the Division of Arts & Humanities, or the History Department, or Linguistics; or, a graduate student affiliated with one of those departments.
  - A computer science student is defined here as an undergraduate with a declared major in EECS, CSE, or CS, or a graduate student affiliated with the CS division or the I-School.
- contain no more than 4 members total.
- have members who have registered to participate in HackFSM.
  - Participants may register for HackFSM as a pre-defined team, or as individuals who will later form a team.

Mentorship

A team of coding mentors will be available to all teams participating in the HackFSM events. Mentors will be available in person at the kick-off event, and available throughout the hackathon timeframe (April 1-12, 2014) on a limited basis to answer questions and provide guidance.

Judging

- All entries will be judged against *specific judging criteria* [italicized text was linked to a webpage with information present in sections 5.3.4 and 5.3.5 of this white paper].
- Each participating team will have the same amount of time as all of the other competing teams to develop a fully or partially functional web interface.
- Each team will have the same amount of time to present to the judges their entry at the end of the coding period.
- All entries must be submitted at the end of the coding period: April 12, 2014 at 12 pm.
- All entries must be presented by a team member participant at the HackFSM judging session that same day, otherwise the submission will not be reviewed by the judges and participants will not be eligible for prizes.
- Presentation order for teams will be randomly assigned at 11:45 AM on April 12.

- One or more entries may be selected to be deployed using university resources for a period of 18 months. This may or may not include the winning entry.
- All decisions of the judges are made at the judges' sole discretion and are final in all matters relating to the HackFSM events.

8.4 API Terms of Service and Disclaimer

TERMS OF SERVICE

The Bancroft Library has assigned a Creative Commons Attribution-Noncommercial-Share Alike 3.0 United States License (http://creativecommons.org/licenses/by-nc-sa/3.0/us/) to the metadata accessible via the FSM Digital Archive API and Solr Index. This license grants permission for non-commercial, attributed re-use of the metadata accessible via the FSM Digital Archive API and Solr Index.

Attribution should include the creator name (fsmCreator), if available in the metadata, and the name of the holding institution, as follows:
Credit: [Creator Name], Courtesy of The Bancroft Library.

Materials represented or linked in the data accessible via the API and Solr Index are made available for non-commercial use. Some materials represented or linked in the data accessible via the API and Solr Index may be protected by the U.S. Copyright Law (Title 17, U.S.C.) or subject to other rights, such as rights of privacy or the use of names and likenesses. Transmission or reproduction of materials protected by copyright beyond that allowed by fair use requires the written permission of the copyright owners. Works not in the public domain cannot be commercially exploited without permission of the copyright owner. Responsibility for any use rests exclusively with the user.

The Bancroft is eager to hear from any copyright owners who are not properly identified so that appropriate information may be provided in the future. The Bancroft will work in a timely manner to remove material from public view as it addresses any copyright concerns or other issues such as libel or invasion of privacy.

Disclaimer

The Bancroft Library plans to host the FSM Digital Archive (Solr) API for a period of 18 month, ending November 1, 2015. The Bancroft Library makes no representations or warranties of any kind, express or implied, as to the API or Solr Index's operation or the information, content or materials included via the API or Solr Index; all of which are provided on an "as is" and "as available" basis. To the full extent permissible by applicable law, The Bancroft Library hereby disclaims all warranties, express or implied, including but not limited to implied warranties of merchantability and fitness for any particular purpose. The Bancroft Library will not be liable for any damages of any kind arising from your use of or inability to use the API or Solr Index. You expressly agree that you use the API and Solr Index, or any materials or content accessible via the API or Solr Index, solely at your own risk. You also hereby agree to indemnify UC Berkeley and The Bancroft Library, its employees, agents, and affiliates from any and all claims and/or damages (including but not limited to reasonable attorneys' fees) resulting from any claim brought by any third party relating to your use of the API or Solr Index, or any materials or content obtained from the API or Solr Index.

8.5 Mentor Guidelines

Onsite tech and subject mentors act as floating resources for the duration of the hackathon, and help teams define workflow, generate ideas, problem-solve, and develop final presentations. (cribbed from Geeks Without Bounds)

Mentors are free to communicate among themselves as questions or observations of interest occur. The organizers would be glad to see mentors gain insight from their participation -- whether on technical issues, hackathon dynamics, or about the FSM materials.

In your role as a mentor for the FSM Hackathon, the organizers suggest you keep the following in mind:

1. **Be available for participants.** Participants will contact mentors they believe will be able to address their questions (on the basis of mentor bios, relationships formed at the kickoff event, etc.). Responding to teams' questions is not a 24/7 responsibility, but please check the communication channels you've listed regularly, and get back to participants in a reasonable timeframe. The teams have 12 days to complete their work, so a response within one day would be appreciated -- even if that response is to let participants know that you can help them out but can't respond in detail until <fill in your timeframe here>.
2. **Offer what you know**. It's better to acknowledge not-knowing than to point teams down a wrong or sub-optimal path. Your advice about reliable on-line sources of information might be as or more valuable to participants as answers to their specific question -- whether of technical information or of information to do with the FSM and/or materials in the Bancroft's digital archive. Especially if you're not sure. Feel free to refer teams to another mentor if you know that s/he is better suited to answer a given question.
3. **Don't join a team, you are not a hackathon participant**. Tempting as it might be to dash off a few lines of code, or a couple of paragraphs for a team's web site About page, please curb your enthusiasm! Pointers, reference to examples, advice about design are all in-bounds. Contributing to the team's actual work product is not the role of a mentor.
4. **Share questions and answers.** To the degree possible, we would like all teams to benefit from questions asked and answered in team/mentor interactions. Mentors are strongly encouraged to summarize questions/answers for posting to the whole group of participants. As we get close to the kickoff date, hackathon organizers will announce how information is to be shared among participants, and how mentors should publish to the selected platform.

8.6 Budget

Prizes

Each member of the winning team (up to 4 people) will receive one 11-inch MacBook Air.
Each member of the second-place team (up to 4 people) will receive an iPad mini.

11-inch MacBook Air	$949	x4 people	$3796
iPad mini	$299	x4 people	$1196
Taxes, other fees, etc. (from campus purchasing system)			$473.28

Refreshments

We anticipate having 100 participants at the kick-off and the judging events.

25 Domino's pizzas + 10 pop	$480	x2 events	$960

Promotion

200 die-cut stickers with event logo		$130
100 color promotional posters	$80	

Misc. supplies

Plates, napkins, cups, etc.		$50
Poster boards, markers, name tags, stickers	$100	

8.7 Project submission form

All fields are required.

1. **What is your group's API key number**
The name associated with your app ID and app key (e.g. fsm_library_0)

2. **Please give the URL where we can access the code and associated code documentation for your project.**
This can be a repository (like GitHub) or a pointer to a zip file on Dropbox.

3. **Please give the URL where we can access the deployment documentation for your project.**
This addresses technical judging criterion #5: "Are steps necessary to deploy the interface and its dependencies, however complex or trivial, documented and cited so that a person with system administration skills but who is only marginally familiar with the technologies used can efficiently review and execute those steps?"

4. **Please list the dependencies (languages, libraries, frameworks, and/or platforms) used in developing this project. Please indicate if any of them are not open source.**
Technical judges will review the dependencies to ensure that you are using open source languages and platforms. (Note: it's okay to deploy your project for the presentation in any container for your demonstration, but your documentation should describe the steps needed to deploy it in an open source container.)

5. **Email address of your group's primary technical contact**
Technical judges may have follow-up questions. Please include the email address of someone who will be available to answer questions by email between 12-2:15 PM on Saturday.

6. **Name(s) of team member(s) who will present the project.**

7. **List the name of each team member, their major / department, and a brief (one sentence) description of how they contributed to the project.**

8. **I verify that all team members are currently registered UC Berkeley students and this submission conforms to the UC Berkeley Honor Code.**