BEDEWORK & LARGE VENUE TICKETING

Wednesday, October 01, 2008

SUMMARY

A ticketing system for opening events of Rensselaer's Experimental Media and Performing Arts Center was developed using Bedework as the central component. The system allows users to register, request tickets, and build an event agenda. Super-users can download event registrations, update tickets for any user on any event, and place tickets on hold. Event data is exported for outboard reporting, analyses and ticket printing.

This approach exploits the calendar as the application platform - all event information is stored in Bedework, and incorporated into the registration system, the EMPAC Opening website, and a calendaring site for mobile (handheld) devices.

THE BACKSTORY

EMPAC – THE BUILDING

A single structure incorporating four distinct and specialized venues under one roof, EMPAC includes an acoustically optimized 1,200-seat concert hall for musical performances and ceremonies, a 400-seat theater, and two unique studios, measuring 3,500 and 2,500 square feet respectively, created for flexible uses by artists or researchers.

Rensselaer held an architectural competition in 2001, which led to the engagement of the international architectural firm Grimshaw as the design architects and Davis, Brody, Bond of New York as architects of record.

The concert hall, a world-class venue for orchestras, is equally capable of accommodating presentations with electronically generated sound and video projection.

The theater's 40-foot by 80-foot stage and 70-foot "flytower" promise to meet the best standards of professional performing arts companies while providing a very rare facility for experimental artists. The framing of the side galleries of this venue allows projection screens and loudspeakers to be attached to create an immersive virtual environment for performers, audience members, or

researchers working in the space. By lowering the fire curtain, the stage alone may be used as a large lab in which any object, even of great weight, can be flown in the 3-D space under computer control.

Studios one and two are suited for music and dance presentations, respectively, but also are optimized for scientific visualization, animation, immersive video projection, free space optics, and acoustical and architectural studies, among many other capabilities.

In addition to the four large performance spaces, the building includes a 1,500-square-foot rehearsal studio, four studios for artists in residence, suites for audio and video production, a major research suite, plus an atrium lobby and cafe. Each of the large spaces is acoustically isolated and capable of diverse video and audio production. The building is linked to the Rensselaer Computational Center for Nanotechnology Innovations (CCNI) as well as to the studios of WMHT-TV, the Capital Region's public television station based in the Rensselaer Technology Park in North Greenbush.

EMPAC – THE PROGRAM

While a wholly new facility and program, EMPAC builds on the traditional strengths of Rensselaer, says Rensselaer President Shirley Ann Jackson. "We have taken the distinctive heritage of the Institute as a scientific, engineering, and technological university, and have created a place where scientists come together with artists for research and education at the nexus of the arts, the sciences, and technology in a venue of unparalleled quality."

EMPAC was designed to serve as a platform for pioneering discovery in the arts and sciences, and as a home to an emerging, collaborative community of artists, engineers, scientists, and designers.

"When paired with the CCNI supercomputer, EMPAC will enable human-scale interactive exploration of immersive/sensory environments," stated John Kolb, vice president for information services and technology and CIO. "This will allow broad exploration in fields such as dynamic investigation of fluid dynamics, artificial intelligence, free-space optics, molecular design, financial modeling, nanotechnology, gaming, and more."

"With EMPAC our aim is to create an intellectual community that did not before exist, and a cultural change at Rensselaer that will reverberate globally," says President Jackson. With capabilities in visualization, animation, simulation, acoustics, haptics, optics, and more, EMPAC also will be a rich environment for student research and learning.

Making the recommendations about what performance pieces get produced—as well as what artists are invited for long-term creative residencies in the building—is a team of three curators, part of EMPAC's current 24-member staff. Until recently "curator" was a term primarily used in the museum

realm, referring to specialists who keep abreast of trends in the field, make programmatic decisions, and supervise the production and installation of shows.

The three EMPAC curators are focused on music, dance, and visual art, respectively, but they each take such broad views that their individual terrains are never sharply defined.

Remembering that the "E" in EMPAC is for experimental, the curator's decisions aren't based just on who's plugged into the latest gadgets. "I've come to believe that 'technology' is one of the most dangerous euphemisms of our times," says music curator Micah Silver. "So what if an artist uses a laptop? That's superficial. EMPAC is about people choosing to go their own way, to create their own language. I look for some new way to experience sound that makes the world bigger and broader."

EMPAC – THE TICKETING SYSTEM PROJECT

The process to identify a ticketing system for Rensselaer recognized that in the long run, a large venue system such as Tessitura Arts Enterprise Software might be appropriate, but for the grand opening events, an ASP or SaaS solution would be adequate. The grand opening events, just over fifty in number, span the first three weekends in October, and consist largely of exhibits, symposia, performances, and other, special events, such as a presidential colloquy.

As contractual issues delayed providing the preferred ASP/SaaS ticketing solution, the EMPAC technical staff reached out to the Communications & Middleware Technologies group (CMT) to discuss writing the necessary software in-house, albeit on an extremely accelerated and tight schedule.

There was no fee or cost associated with any of the 54 EMPAC opening events. The lead developers for the Bedework Enterprise Calendaring System are members of CMT, and another member of the group had previously developed a registration system in Ruby-on-Rails. The group believed that perhaps developing some additional code to tie together the Ruby-based registration system with Bedework might allow them to deliver the necessary functionality within the very tight time constraints.

An initial meeting between the technical staffs of EMPAC and CMT hammered out a collaborative approach (as well as some rudimentary specifications):

1. EMPAC staff would producing the web pages,
2. which would rely on the "backend" technology produced by CMT,
3. both of which would draw event data from Bedework,
4. which would also be used to generate a site for smart phones and mobile devices

Shortly thereafter, the ASP contractual issues were resolved, but both staffs felt it was too late in the process to "change horses", as it were.

Almost immediately, it was decided to abandon the Ruby-based approach and to start from scratch, developing in the Spring Application Framework which was already familiar to most of the CMT team.

The system went live almost exactly 3 weeks after the initial, exploratory meeting, with almost all testing being done "on the fly". The system has been redeployed a few times to accommodate minor changes and bug fixes. With two days to go prior to the first event, more than 1000 users have registered and reserved event tickets.

Project Components

The project is comprised of the following components:

1. An EMPAC Opening web site from which users can browse and view events and request tickets.
2. A registration system for managing users and ticket requests.
3. A calendaring system (Bedework) from which to pull event information.

Project Overview

By storing event data in Bedework, only one authoritative source of event information needs to be maintained. In return, event data is made available to other systems that need it, such as the campus calendar suites, digital signage and cable TV, the EMPAC Opening website, the ticketing system, RSS feeds, and others.

Event data is provided to the static EMPAC Opening website via JSON feeds and to the ticketing system via XML feeds. All feeds are produced in real time.

Figure 1 shows how the components work together:

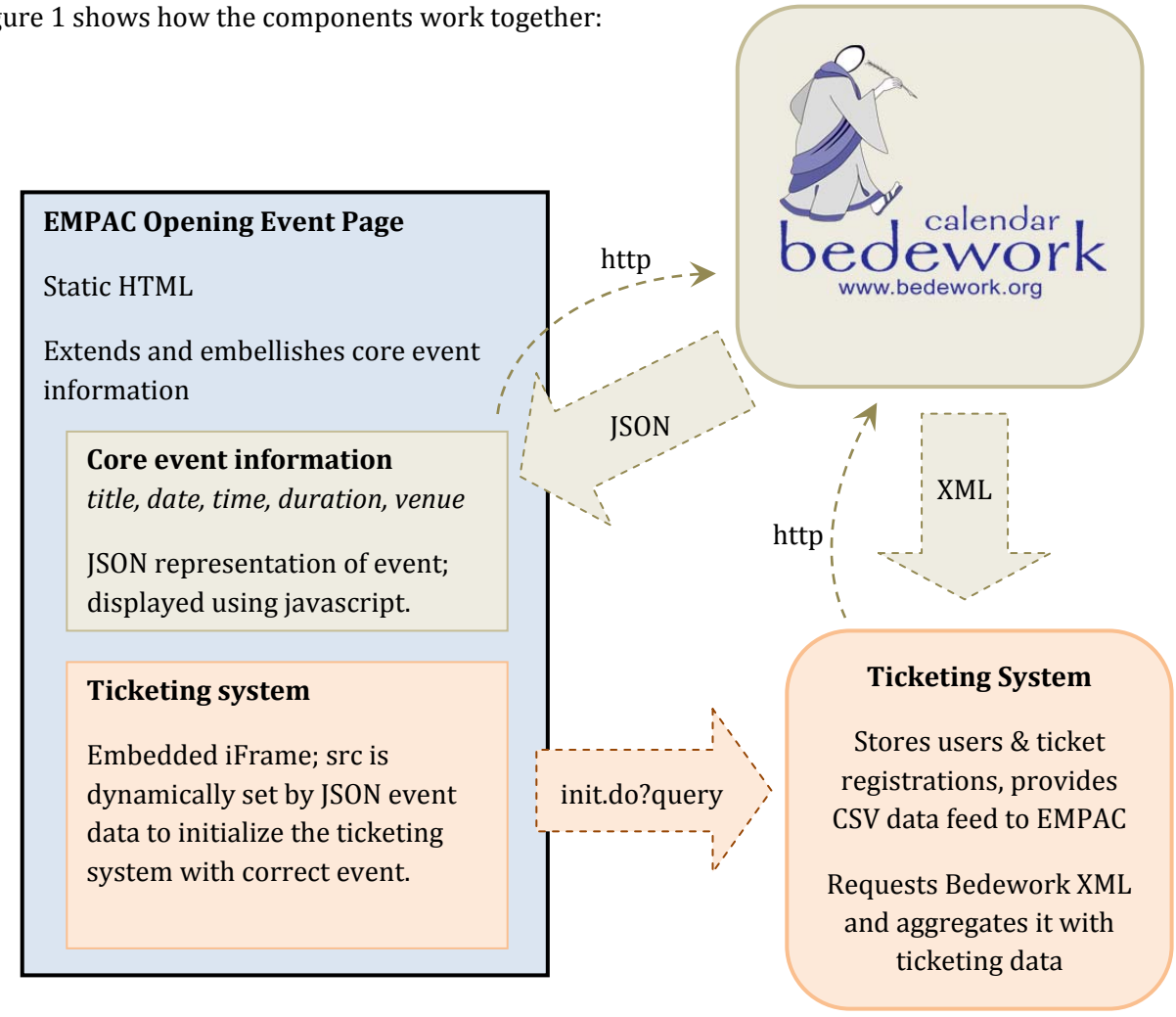


Figure 1 – Ticket system components

X-PROPERTIES

X-Properties, or extension properties, provide a standard means of extending RFC 2445 iCalendar events with implementation-specific properties.

To support the ticketing system, EMPAC events were extended with the following X-Properties:

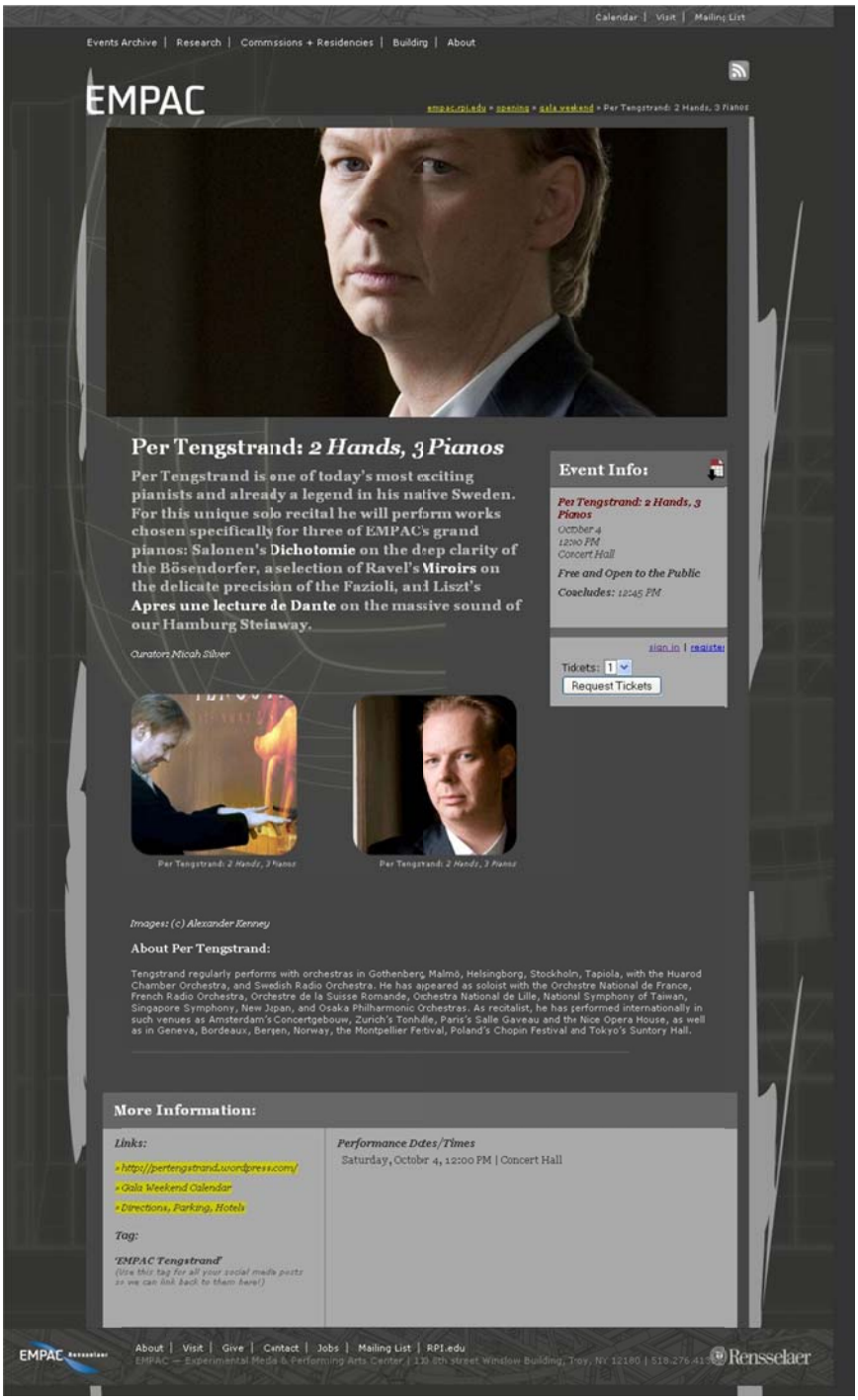
1. eventType (for presentation)
2. totalRegistrants (for max number of tickets at a venue, e.g. 300)
3. ticketsAllowed (number of tickets allowed to a regular user, e.g. 4)
4. empacKey (unique key to associate the event with EMPAC's local scheduling database)
5. registrationDeadline (date and time of registration cut-off)

The Bedework admin client reveals these fields only to calendar administrators logging in as part of the EMPAC administrative group. Note that image X-Properties, allowing the addition of image URLs, are already included in Bedework version 3.4.1.1.

TICKET SYSTEM PROGRAM FLOW

The EMPAC Opening web site requests JSON event lists from Bedework and displays them using JavaScript. Each of the three weekends and an "at-a-glance" calendar view are produced in this way (figure 2). The JSON object is included by placing a <script> tag in the html <head> section with a source URL that specifies the range of dates, a creator filter (to retrieve only events produced by the EMPAC group), a skin name (to output the response as JSON), and an object name (for setting up the name of the JSON object to be referenced – necessary if one needs to call several event list objects on the same page).

h JSON



ın iFrame

The link to each static event page is included in the event data, and each event page likewise includes a <script> tag that draws in a JSON object for the specific event.

The event pages sport an "Event Info" box rendered by JavaScript from calendar data that include an iCal download, title, date, location, and duration (figure 3).

Event pages also include an iFrame into which the ticket system is loaded. Upon initialization, the system checks to see if an event is full or if the ticket registration deadline has passed and displays an appropriate message.

The program flow for the ticketing application can be found in Appendix A. Every page of the ticketing system calls on event data from Bedework. The data is returned as XML for either a single event or multiple events. The event data is aggregated with registration data for use within the UI or for CSV generation (super-users only).

To request tickets, users must register and sign into the system with a valid email address. Once authenticated, tickets are added to the user's "Reservation List" where they can be updated or removed (figure 4).

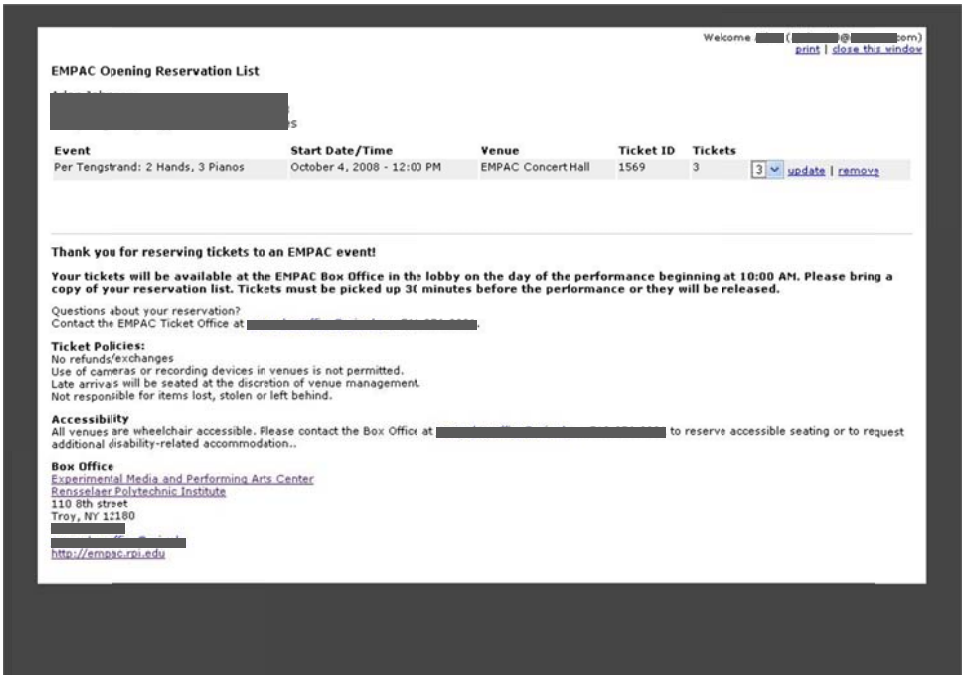


Figure 4 - User's "Reservation List"

Super-users can view all registrations for a specific event, and place an unlimited number of held tickets into the queue (figure 5).

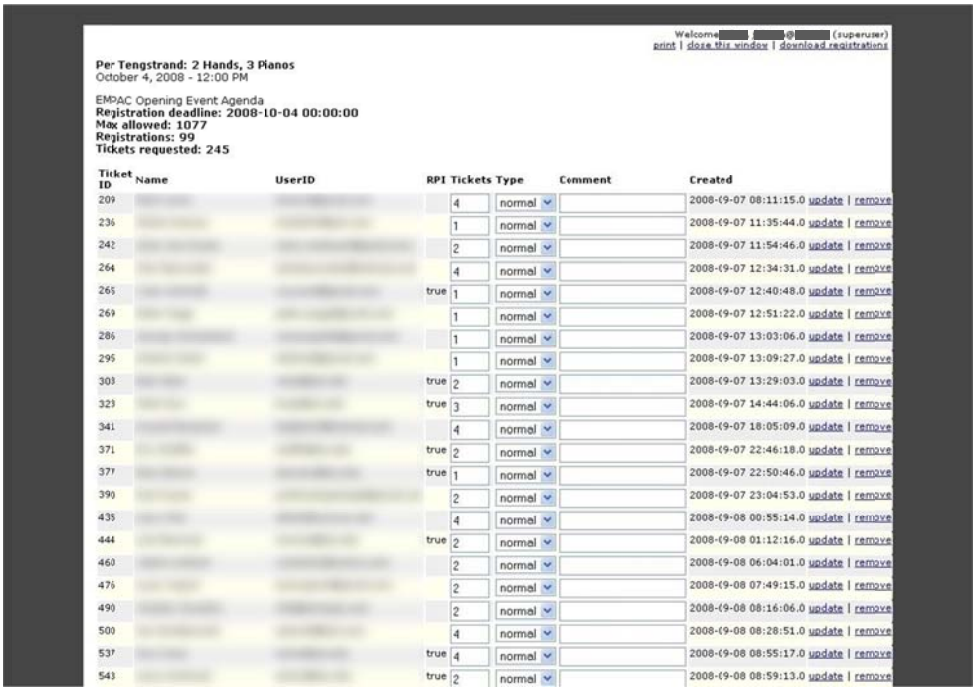


Figure 5 - Super-user's "event agenda" view

Super-users can download a CSV version of all aggregated event and registration data from any super-user page.

OBSERVATIONS AND REFLECTIONS

Using the Bedework Calendar System as the source of event information provides a flexible means of passing authoritative event data between systems.

We note:

- By maintaining only user and registration data in the ticketing system, the application development effort was greatly reduced. The system was more implemented than architected. The pseudo web-services model was implemented for expediency, and to facilitate the collaboration between two, distinct, technical teams, but it would not be a stretch to implement a more standard, SOA approach.

  The decision to provide functionality outboard of the application proper was a consequence of the tight constraints and evolving requirements, but also as a failsafe mechanism which would allow the EMPAC staff to meet critical needs even if the application did not prove to meet all the requirements.

- While EMPAC's supplemental event information could also have been stored in X-Properties, and the EMPAC Opening website generated using a Bedework Calendar Suite, the passing of lightweight JSON event feeds to static HTML pages resulted in a more equitable collaboration between CMT and the EMPAC staff. Web developers comfortable with the creation of static HTML are able to build pages in a way with which they are comfortable, and the display of event data is as flexible as the JavaScript developer is comfortable working with JSON objects.

- It would be very useful to have a standard mapping of icalendar (RFC 2445) into XML and to JSON. There are many non-standard representations of the former, but none of the latter that we are aware of. CalConnect, The Calendaring and Scheduling Consortium, has assembled a technical committee to produce recommendations on XML representations.

- Date calculations can be complex, and may prove to be vexing for developers who do not have experience in calendaring applications. Simple minded approaches to date manipulation are bound to fail. Where the calendar system does not provide a particular output, it must be calculated externally. One such missing component was duration; while easy to calculate from two date objects in JavaScript, it does require some programming skill and facility with mathematics. It is valuable to identify these kinds of components in advance and, where possible, provide them from the calendar system itself.

- Events that span multiple days, such as exhibits, create presentation challenges, both in this application and calendaring in general. We chose to display exhibits differently from other events by listing their beginning and ending dates, omitting duration and start/end times. This begs the question of how to handle all arbitrary "ongoing" events such as Alumni tours to Europe, registration periods, or any other event that spans a long period. Do we arbitrarily distinguish events lasting more than a week? Two weeks? Do we let users tag an event as ongoing? Ongoing events that appear in a calendar grid give the impression of being of greater

importance when they span many days.

- Events in the performing arts are rich in meta-data much of which is not well supported by the current calendaring standards. The EMPAC Opening web site contains a great deal of event information that does not come from the calendar system – much of it rich text (html markup). This includes article-length event descriptions, multiple images, performer and lecturer bios, and detailed venue information none of which can be accommodated by the current iCal standard except through the use of X-Properties. vCards may provide a more standard and natural way to store some of this information in an event. Rich text handling might follow the multi-part message model of email.

  As noted previously, this application did use X-properties, but only in support of the registration system, not to provide important detail about an arts event.

  On the other hand, Juilliard, the world renowned performing arts conservatory, has enhanced their Bedework implementation with the ability to add the following arts-related field from the Bedework admin client: event audio and/or video, descriptions, programs, principals, next appearance, highlights, and ticket information. Additionally, event information can be directed to digital signage and/or the venue displays.

- Driving an application from a calendaring system has some significant advantages. Although we did not realize all these advantages, we were able to repurpose the event data in a number of ways, including generating content for our web site for mobile (handheld) devices.

APPENDIX A
EMPAC OPENING TICKETING SYSTEM PROGRAM FLOW

Tuesday, August 26, 2008
Communication and Middleware Technologies
DotCIO, Rensselaer Polytechnic Institute

PURPOSE:

A web based registration and ticketing system allows users to request tickets to EMPAC Opening events during the period of September 2 – October 19, 2008.

REQUESTOR:

EMPAC: Shannon Johnson (primary), Peter Wargo, Holland Hopson

PROGRAM FLOW:

1. Actor: **user**, e.g. "Susan" who works in Albany and wants to attend a concert.
    a. Susan visits the EMPAC Opening web site
    b. Susan finds an event she wants to attend
    c. Susan may log in at this time by selecting "Log In" (a link) (see 1.d.i.2.a)
    d. If the registration deadline (set by EMPAC) has not passed and registrations are not filled,
        i. Susan selects the number of tickets she wants (set by EMPAC) from a pull down list and clicks "Request Tickets" (button)
            1. If Susan is logged in, the tickets request is added to her reservation list. Susan can look at her list to see the events and tickets she's requested.
                a. Susan may delete an event from her list
                b. Susan may update the number of tickets she's requested on her list (she cannot increase tickets when an event is full)
                c. If Susan requests tickets for an event twice, her list will reflect only the most recent request
            2. If Susan is not logged in
                a. Susan is given a log in form
                    i. If Susan does not have an account she may register
                        1. Susan selects "Register" (a link)
                        2. A pop-up window is provided requesting the following fields:
                            a. First Name
                            b. Last Name
                            c. Email Address

d. Phone Number
e. Street Address 1 (optional?)
f. Street Address 2 (optional)
g. City (optional?)
h. State (optional?)
i. Country (optional?)
j. Postal code (optional?)

3. Susan submits the form and is sent an email confirmation – the web response explains that she must check her email to confirm the registration
4. Susan clicks a link in the sent email to confirm registration.

b. Susan logs in
c. Susan's request is added to her list (proceed to 1.d.i.1)
d. Susan will pick up her tickets at the box office at a designated period prior to the event by presenting her reservation list

e. If the registration deadline has passed or registration is filled,
    i. Susan will be given an appropriate message (determined by EMPAC), e.g. that tickets *may* be available 30 minutes prior to the event at the box office – first come first served.

2. Actor: **super-user**, e.g. "Shannon" who is an employee of EMPAC
    a. Shannon logs in
    b. Shannon holds VIP tickets
        i. Shannon selects an event from the EMPAC Opening web site
        ii. Shannon may fill in a text field for the number of tickets desired, sets the "type" of tickets to "Hold", and clicks "Request Tickets" (button)
    c. Shannon views or modifies the agenda for a specific event
        i. Shannon selects an event from the EMPAC Opening web site
        ii. Shannon selects "view agenda" from the event page
        iii. Shannon received full agenda for all registrants and can view, modify, or delete ticket requests (including hold requests)
    d. Shannon requests a full CSV data dump of event registrations
        i. Shannon selects any event from the EMPAC Opening web site and selects the link "Download EMPAC Registrations"

ARCHITECTURE:

6. Events
    a. All event data is maintained in the Campus Events Calendar. The calendar will be extended with X-Properties to include the fields
        i. eventType (for presentation)
        ii. totalRegistrants (for max number of tickets at a venue)
        iii. ticketsAllowed (number of tickets allowed to a regular user)
        iv. empacKey (to associate the event with EMPAC's local events database)

v. registrationDeadline (for the cut-off date and time of registration)

b. Event data will be aggregated (using pseudo web services) with registration data by the registration system.
c. Event registration will be instantiated per event by passing the event guid to the registration application (as src of iFrame).

7. Users – the registration system will store the following user data
    a. UserID - unique
    b. First name
    c. Last name
    d. Email address
    e. Phone number
    f. RPI student/faculty/staff?
    g. Street Address 1
    h. Street Address 2
    i. City
    j. State
    k. Country
    l. Postal code
    m. Type – "superuser" or "user"

8. Registrations - the registration system will store the following registration data
    a. UserID – unique, from user table
    b. EventGuid - from the event calendar
    c. QueryStr – to store full path to get event from calendar
    d. EventID – automatically generated ID appropriate for printing on tickets, e.g. *EventID*-1, *EventID*-2, etc.
    e. NumTickets – number of tickets
    f. Type – "VIP" or "normal"
    g. Comment – used by super user to provide comments, e.g. for VIP explanation
    h. Created – date/time added
    i. LastMod – date/time of last modification

APPENDIX B
JSON REPRESENTATION OF BEDEWORK EVENT


```
{
    "bwEvent": {
        "summary" : "Per Tengstrand: 2 Hands, 3 Pianos",
        "subscriptionId" : "351",
        "calPath" : "%2Fpublic%2FArts%2FConcerts",
        "guid" : "CAL-00f18252-1bf7a4a3-011b-ff324144-00000785calendars@rpi.edu",
        "recurrenceId" : "",
        "link" : "http://www.empac.rpi.edu/events/opening/gala/pertengstrand.html",
        "eventlink" :
"http://events.rpi.edu:80/event/eventView.do?b=de&amp;subid=351&amp;calPath=%2Fpublic%2FArts%2FConcer
ts&amp;guid=CAL-00f18252-1bf7a4a3-011b-ff324144-00000785calendars@rpi.edu&amp;recurrenceId=",
        "status" : "CONFIRMED",
        "start" : {
            "allday" : "false",
            "shortdate" : "10/4/08",
            "longdate" : "October 4, 2008",
            "time" : "12:00 PM",
            "jstime" : "12:00:00",
            "utcdate" : "20081004T160000Z"
        },
        "end" : {
            "allday" : "false",
            "shortdate" : "10/4/08",
            "longdate" : "October 4, 2008",
            "time" : "12:45 PM",
            "jstime" : "12:45:00",
            "utcdate" : "20081004T164500Z"
        },
        "location" : {
            "address" : "EMPAC Concert Hall",
            "link" : "http://www.empac.rpi.edu/"
        },
        "calendar" : {
            "name" : "Concerts",
            "path" : "/public/Arts/Concerts",
            "encodedPath" : "%2Fpublic%2FArts%2FConcerts"
        },
        "categories" : [
            "Performance",
            "Performance"
        ],
        "description" : "Per Tengstrand will perform works chosen specifically for three of EMPAC's
grand pianos: the deep clarity of the Bosendorfer, the delicate precision of the Fazioli, and the
massive sound of our Hamburg Steinway.",
        "contact" : {
            "name" : "EMPAC",
            "phone" : "555-555-5555",
            "email" : "address removed",
            "link" : "http: //www.empac.rpi.edu/"
        },
        "xproperties" : {
            "X-BEDEWORK-EVENT-TYPE" : {
                "values" : {
                    "text" : "Performance"
                }
            },
            "X-BEDEWORK-SUBMITTEDBY" : {
                "values" : {
                    "text" : "johnss3 for EMPAC (agrp_empac)"
                }
            },
            "X-BEDEWORK-IMAGE" : {
                "values" : {
                    "text" : "http: //www.empac.rpi.edu/graphics/calthumbs/pertengstrandThumb.png"
                }
            },
```

```
            "X-BEDEWORK-TICKETS-ALLOWED" : {
                "values" : {
                    "text" : "4"
                }
            },
            "X-BEDEWORK-EMPAC-KEY" : {
                "values" : {
                    "text" : "081004CH2_E1"
                }
            },
            "X-BEDEWORK-REGISTRATION-DEADLINE" : {
                "values" : {
                    "text" : "2008-10-04 00: 00: 00"
                }
            },
            "X-BEDEWORK-TOTAL-REGISTRANTS" : {
                "values" : {
                    "text" : "1066"
                }
            }
        }
    }
}
```

APPENDIX C

THE IMPLEMENTATION TEAM

EMPAC

Holland Hopson, EMPAC Opening Logistics Integrator
Shannon Johnson, Web Director
Peter Wargo, Manager of Information Systems

Communications & Middleware Technologies

William Gill, Web Producer
Arlen Johnson, Senior Web Producer
Alan Powell, Senior Systems Programmer
Gary Schwartz, Director