Team 09 – Architecture Review Board

City of Los Angeles
Public Safety Applicant Resource Center

Software Engineering - Fall 2013

October 17, 2013

http://greenbay.usc.edu/csci577/fall2013/projects/team09/
Reduce labor hours by developing an automated process for collecting Applicant's background information.

- Developing a web-based system for:
  - sending reference request and collecting their responses.
  - retrieving and processing the reference responses.
The Team
Team Members

- Vaibhav Mathur: Project Manager & Prototyper
- Arijit Dey: Requirements Engineer & LCP
- Divya Nalam: Operational Concept Engineer
- Preethi Ramesh: Feasibility Analyst & Req. Engineer
- Rakesh Mathur: II&V, Quality Focal Point
- Shreyas Devraj: LCP & Project Manager
- Gaurav Mathur: Builder & UML Designer
Team Strong and Weak Points

• Team Strengths
  ✔ Fairly cohesive with regards to goals and commitment to project
  ✔ Highly focused on completing deliverables
  ✔ High level of communication between developers using multiple channels
  ✔ Highly skilled with regards to technical abilities
Team Strong and Weak Points

- **Team Weaknesses**
  - Scheduling issues due to larger team & varying class schedules
  - Unfamiliarity with ASP.NET/C# programming
  - Unfamiliarity with DB2 database systems
Project Technical & Operational Concerns

- **Ability to make system secure**
  Solution: Present our prototype, get feedback from client, then re-evaluate and refine it to cater to client needs

- **Familiarity with ASP.NET**
  Solution: Development team has developed prototype in ASP.NET with C# and has gotten more comfortable with the ASP.NET platform and C#.

- **Familiarity with DB2 and interoperability with ASP.NET**
  Solution: Development team can train themselves on DB2 and improve ASP.NET prototype to work with DB2.

- **Project Scope to deliver this semester**
  Solution: Work with client and come to an agreement about what code (if any) can be delivered by the end of this semester

- **Familiarity with client environment and infrastructure**
  Solution: Client can deliver details of current environment and infrastructure which will reduce those risks.
Project Concerns

• Sources of Observation
  ○ Win-Win Negotiation Meetings
  ○ Team Meetings
  ○ Team Communication
  ○ Evaluation of VC and FC package
    ✴ FED (Feasibility Evidence Description)
    ✴ OCD (Operational Concept Description)
    ✴ LCP (Life Cycle Plan)
Overall Project Evaluation

- SCS’s CRACKness (Collaborative, Representative, Authorized, Committed, and Knowledgeable)
  - All SCS’s for this project possess CRACK characteristics
- Complexity
  - Project is fairly complex specially considering interoperability with external systems
- Precedentedness
  - The team is familiar with various kinds of Web applications
- Communication & use of communication tools between on-campus team, S/PE and client
  - Communication between Development team (including S/E) is high by using various methods of communication. Communication with client could be better
- Skills Needs/Match
  - The skill set of the team combined is pertinent enough to match the needs of this project.
- Knowledge/experience mis-matches
  - Although Development team is familiar with Web Applications, Highly secure web applications in a unfamiliar environment is a challenge
Operational Concept Design
System Purpose

Automation of the current reference processing

- Reduce the paper work involved
- Avoid dependence on the postal system
- Expedite the process of reviewing references
Shared vision

Assumption: The new system will be accepted by the staff of the City of Los Angeles

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Initiatives</th>
<th>Value Propositions</th>
<th>Beneficiaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developers</td>
<td>Develop the web based system for reference letters processing</td>
<td>Reduce the labor involved in processing references letters</td>
<td>Applicants</td>
</tr>
<tr>
<td>Management and staff of City of LA</td>
<td>Provide training to the City staff to use the new system</td>
<td>Expedite application process</td>
<td>Background investigators</td>
</tr>
<tr>
<td>IT department of the City of LA</td>
<td>Maintain the web based system</td>
<td>Reduce administrative costs (postal)</td>
<td>Managers/ Background Investigation Supervisor</td>
</tr>
<tr>
<td></td>
<td>Advertise the new system</td>
<td>Decrease paper work</td>
<td>Supporting Staff</td>
</tr>
<tr>
<td>Costs:</td>
<td>Time spent by client in giving inputs to development team, evaluating prototypes and training staff.</td>
<td>Benefits:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reduced costs (postal charges avoided)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reduced time in sending reference requests and receiving responses</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reduced effort for staff due to avoiding paper work and for managers due to electronic assignment of investigators</td>
<td></td>
</tr>
</tbody>
</table>
# Capability goals

<table>
<thead>
<tr>
<th>Capability Goals</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OC-1: Automatic email generation to references</strong> : The system provides for support staff to fill in the candidate and reference information electronically so as to automatically send emails requesting reference letters.</td>
<td>1</td>
</tr>
<tr>
<td><strong>OC-2: Reference letter completion</strong> : The systems provides for references to submit their letters online and stores them in the database.</td>
<td>1</td>
</tr>
<tr>
<td><strong>OC-3: Display of reference letters</strong> : The system is capable of displaying the completed reference letters to investigators.</td>
<td>1</td>
</tr>
<tr>
<td><strong>OC-4: References review and reminders sending</strong> : The system allows investigators to review the references for each candidate assigned to him and send reminders to those references who have not yet responded.</td>
<td>2</td>
</tr>
<tr>
<td><strong>OC-5: Manager reviews</strong> : The system allows managers to review the candidates assigned to each investigator and the reference status of each candidate.</td>
<td>2</td>
</tr>
<tr>
<td><strong>OC-6: Investigator assignment</strong> : The system allows investigators to view unassigned candidates and assign the candidates to themselves.</td>
<td>2</td>
</tr>
<tr>
<td><strong>OC-7: Investigators update</strong> : The system allows managers to add, edit or delete investigators.</td>
<td>3</td>
</tr>
</tbody>
</table>
Proposed new system: Element Relationship
Proposed New System: Business work-flow

Basic work flow for reference processing
Proposed New System: Business Work flow

Work flow for manager reviews and investigator assignments
Prototype Presentation
Win-Conditions addressed in Functional Prototype

✓ As a Support staff I can enter the candidate information and email addresses of the references to generate emails to references quickly.

✓ As a Reference I can complete the reference letters online.
Module 1

SUPPORT STAFF MODULE
Work Items & Steps

• Support Staff logs into the system
• Enter Details of the Applicant – Name, Last Four SSN, etc.
• Enter Details of the Reference(s) of the applicant – Name & Email address
• Clicks Submit
• Add more applicants.
Screen Design

Clicks on the Add Ref Details to add ref details
Screen Design

Clicks on Home to Add Next Applicant

Clicks on Add Another Reference to add next reference for applicant
Module 2

REFERENCES MODULE
Work Items & Steps

• Reference receives a link and a passcode in the email.
• Clicks on the link – Opens the Log In page.
• Enters Email Id and passcode.
• After authentication, View Questionnaire form.
• Fills out the form, Clicks SUBMIT
Enters the Email id as username and passcode (sent in the email)
Screen Design

Fills out the complete form and clicks on Submit
Module 3

INVESTIGATOR MODULE
Work Items & Steps

• Investigator Logs into the system with valid credentials.
• Views a list of applicants assigned to him/her
• Selects an applicant – View list of References and status of the responses.
• Be able to resend the email notification to the reference.
• Views responses from the reference
• Be able to assign unassigned applicants to him.
My Applicants Screen Design

List of Applicants assigned to him

Clicks on any applicant to View References
List of References Screen Design

Applicant Details

List of References

Resend Reminder Email

Clicks on Name to View Response
Response Viewing Screen Design

Views set of responses from the References about the applicant
Self Assignment Screen Design

Clicks on the Unassigned applicants to assign to himself
Selects the applicants and clicks Import
PERSONA
Investigator - Paul Smith

Basic Demographic:
Age: 42
Hometown: Chicago, IL
Marital Status: Married

Attributes
• Tough
• Judgmental
• Skeptical

Description
Paul is a graduate from San Jose State University working as an investigator at the City of Los Angeles. He is married to Jane, a housewife; and 3 kids: Jack (15), Tim (10) and Angelina (2). He likes reading novels and spent time with kids in spare time.

User Scenario
He conducts and compiles personal and professional background investigations for candidates by interviewing employers, co-workers, neighbors, law enforcement officials, military personnel, members of the candidate’s family, and personal references; prepares reports on findings; makes recommendations as to background findings; and performs other related duties. He has to go through each and every details of the candidate and if he finds any clumsy or unorganized information from candidate side, he again has to find personnel to clarify his doubts either by phone or email. As a result, he has to overwork to get everything organized and clear.

Information Sources
• Local newspaper
• Magazines

Goals & Aspirations
A cent percent correct information of the candidate for the recruitment
Reference – Frank Cooper

Basic Demographic:
Age: 61
Hometown: Florida
Marital Status: Married

Attributes
• Short-temper
• Determined

Description
Frank retired 1 years ago, after working for 35 years in the financial department of an insurance company. At 65, he is extremely active. He golfs twice a week in the summer and also play local championships every year. He is proud of his garden and spends an hour daily maintaining his lawn and flower beds. He likes surfing on net

Information Sources
• Google
• Quora
• Social Mixtures

Goals & Aspirations
• Establish a good social network.
• Win local golf tournament.

User Scenario
Frank receives a post from the city of LA. He opens up the letter and found a questionnaire form regarding recruitment of one of his golf partners Fred who is joining LAPD. He is very eager to fill out the form to discuss about Fred but finds very inconvenient to write that all and then go to the USPS to post that. He had to call his nephew to post the envelope.
Support Staff – Duke

**Basic Demographic:**
**Age:** 35
**Hometown:** Santa Clara, CA
**Marital Status:** Married

**Attributes**
Good in on-hands experience in IT. Provides specific operational support functions, duties, or tasks.

**Description**
Duke is a software engineer who pursued his undergrad from Clemson University and is currently working as a supporting staff at the City of Los Angeles. He is married to Ana, teacher in an elementary school. He enjoys playing basketball in weekends and is a die-hard fan of LA Lakers.

**User Scenario**
He spends most of his time glued to PC- especially sending/receiving emails and maintaining the basic database queries at the City of LA. He finds it difficult to maintain the email tracks during recruitment time. He has to maintain thousands of emails every week and has to forward it to respective departments or personnel. He usually faces system crash because of flooding of emails in the server and had to call technicians to fix the systems.

**Information Sources**
- Google
- Social Mixtures

**Goals & Aspirations**
Promotion or a lateral move at the current company.
City IT Staff – Jade Hughes

Basic Demographic:
Age: 27
Hometown: Burbank, CA
Marital Status: Single

Attributes
• Enthusiastic learner.
• Passionate about his work.

Description
Jade is an undergrad from Santa Clara University and is presently working as an IT staff at the City of LA. He also works in a small start-up company nearby at night. Though he has a hectic schedule, he still finds plenty of time to read forums and keep up with exiting stuffs on the web-surfing sites such as Hackers News. He play baseball with his friends on weekends and has been following Yankees from his childhood.

User Scenario
As an IT personal, he has to maintain all servers, installing, updating and configuring computer systems and diagnosing and solving hardware/software faults. Once when the systems crashed out completely, inefficient and haphazard codes written by his predecessors made him toil hard to debug faults and make the system up and running. Most of the time he wastes a whole lot of time in first understanding what code does and then even more time to debug it.

Information Sources
• Hackers News
• Google
• Ethical Hacking tutorials
• Facebook

Goals & Aspirations
Full-time job as an Ethical Hacker in a tech company
Manager – Jack Bauer

Basic Demographic:
Age: 51
Hometown: Dallas, TX
Marital Status: Married

Description
Jack graduated from Rutgers Institute of Technology as Industrial Management Engineer in 1980. Chris had been in a business firm industry for 15 years. He also follows trade market at regular basis and read trade magazines in spare time. He is also an avid fisherman and Lakers fan.

Attributes
• Systematic
• Extremely busy
• Infuriated

Information Sources
• Local newspaper
• Trade Magazines
• CNN.com

Goals & Aspirations
Well organized list of candidates, sorted by name and by whether candidate is assigned or to an investigator or not.

User Scenario
He checks which investigators are assigned to which all applicants and if an applicant is unassigned, he requests every investigator to choose their candidates for investigation. The list of candidates is pretty clumsy and not properly sorted out, as a result of which he has to literally go through each and every applicant to check whether he has an investigator assigned or not.
Requirements
Most Significant Requirements
(in the order of priority)

- **WC_2395** - As a Support staff I can enter the candidate information (Name, Last 4-digit SSN and the department) and email addresses of the references to generate emails to references quickly.

- **WC_2393** - As an investigator I can view reference letters

- **WC_2394** - As a Reference I can complete the reference letters online.
Most Significant Requirements
(in the order of priority)

- **WC_2396** - As an Investigator, I can review candidates assigned to me.

- **WC_2454** - As a Manager I can easily see the list of candidates assigned to any Investigator.

- **WC_2402** - As an Investigator, I can securely log in to the system to review the references.
Architecture
System Context Diagram
USE CASE DIAGRAMS
Support Staff Module

- Get applicant Details
- Get reference details for applicants
  - <<Include>>
  - Triggers emails to references
References
Investigator
Manager

- Investigator module
  - Picks up unassigned candidates
  - Checks status of reference letters
  - Views reference letters
  - Resends email to investigator
Element Relationship
Life Cycle Plan
Purpose

• The Life Cycle plan helps the stakeholders to get a clear picture of
  – what are the objectives to be achieved,
  – when are the milestones & deadlines,
  – what are the products which needs to be delivered,
  – what are the responsibilities
  – what should be our approach towards it,
  – what resources we have, and
  – what are the assumptions in regard to this project.
Status

• At the end of Valuation phase.
• Contains our future plans, updated responsibilities, and milestones to be encountered in the various phases.
• An estimation of the project using COINCOMO is attached to analyze the project’s feasibility within 12 weeks.
Assumptions

• The system will be readily accepted by the City of Los Angeles Staff.

• There needs to be no integration with the current Application System.

• There is no integration with data of current manual applicant investigation process.
Overall Strategy

• The City of Los Angeles Application Resource Center is an online system which built following the *Architected Agile* process as we have to develop the project from scratch with minimum COTS involvement.

### Milestones and Products

<table>
<thead>
<tr>
<th>MILESTONES</th>
<th>DELIVERABLES</th>
</tr>
</thead>
</table>
| Valuation Commitment Review    | Client Interaction Report.  
                                | Valuation Commitment Package                |
| Foundation Commitment Review   | Draft Foundation Commitment Package          |
| Development Commitment Review  | Foundation Commitment Package               |
| Transition Readiness Review    | Development Commitment Package              |
# Responsibilities

<table>
<thead>
<tr>
<th>Team members</th>
<th>Role</th>
<th>Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaibhav Mathur</td>
<td>Project Manager</td>
<td>Current- ASP.Net, C#, Javascript</td>
</tr>
<tr>
<td></td>
<td>Prototyper</td>
<td></td>
</tr>
<tr>
<td>Arijit Dey</td>
<td>Life Cycle Planner</td>
<td>Current- JAVA, Oracle 10g, Visual Basic, HTML, UML.</td>
</tr>
<tr>
<td></td>
<td>Requirements Engineer</td>
<td>Required- C#, MySQL, DB2</td>
</tr>
<tr>
<td>Shreyas Devaraj</td>
<td>Prototyper</td>
<td>Current- JAVA, MySQL, JavaScript</td>
</tr>
<tr>
<td></td>
<td>Project Manager</td>
<td>Required- ASP.Net, C#</td>
</tr>
<tr>
<td>Gaurav Mathur</td>
<td>Builder</td>
<td>Current-JAVA, C++, MySQL</td>
</tr>
<tr>
<td></td>
<td>UML designer</td>
<td>Required-C#</td>
</tr>
<tr>
<td>Preethi Ramesh</td>
<td>Feasibility Analyst</td>
<td>Current-ASP.Net, C#</td>
</tr>
<tr>
<td></td>
<td>Requirement Engineer</td>
<td></td>
</tr>
<tr>
<td>Divya Nalam</td>
<td>Operational Concept Engineer</td>
<td>Current-C/C++, Python</td>
</tr>
<tr>
<td></td>
<td>UML designer</td>
<td>Required- ASP.Net, C#</td>
</tr>
<tr>
<td>Rakesh Mathur</td>
<td>Validation and Verification of</td>
<td>Current- ASP.Net, C#, Javascript</td>
</tr>
<tr>
<td></td>
<td>COTS Interoperability</td>
<td></td>
</tr>
</tbody>
</table>
Approach

Monitoring and Control

• Weekly Meetings & After Class discussions
• Weekend Meets with DEN student
• Progress Reports & PROJECT PLANS
• BUGZILLA - To Raise Bugs & Tasks
• Emails – Peer Reviewing
• Discussions
# APPROACH[Contd.]

## Methods, Tools and Facilities

<table>
<thead>
<tr>
<th>Tools</th>
<th>Usage</th>
<th>Provider</th>
</tr>
</thead>
<tbody>
<tr>
<td>VISUAL STUDIO 2010/12</td>
<td>Used for development of the project.</td>
<td>MICROSOFT</td>
</tr>
<tr>
<td>SQL SERVER 2008</td>
<td>Used as Database for developing Prototype.</td>
<td>MICROSOFT</td>
</tr>
<tr>
<td>DB2</td>
<td>Used as Database for developing Project.</td>
<td>IBM</td>
</tr>
<tr>
<td>ASP.NET</td>
<td>Framework used to develop the Project.</td>
<td>MICROSOFT</td>
</tr>
<tr>
<td>WHATSAPP</td>
<td>Used to communicate minute information between team member.</td>
<td>WHATSAPP</td>
</tr>
<tr>
<td>GITHUB</td>
<td>Source Control tool</td>
<td>Github, Inc.</td>
</tr>
</tbody>
</table>
# List of Modules

The following is module listed in the system and its estimated size with Source Lines of Code (SLOC)

<table>
<thead>
<tr>
<th>No.</th>
<th>Module Name</th>
<th>Brief Description</th>
<th>SLOC</th>
<th>REVL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Login Functionality</td>
<td>Login to the system to access it.</td>
<td>200</td>
<td>8%</td>
</tr>
<tr>
<td>2</td>
<td>Support Staff module</td>
<td>Enter applicant details and add references</td>
<td>600</td>
<td>8%</td>
</tr>
<tr>
<td>3</td>
<td>Investigator Module</td>
<td>View list of applicants, references and responses</td>
<td>800</td>
<td>5%</td>
</tr>
<tr>
<td>4</td>
<td>Reference Module</td>
<td>Ability to login and fill up the reference form</td>
<td>300</td>
<td>5%</td>
</tr>
<tr>
<td>5</td>
<td>Manager Module</td>
<td>Check applicants, investigators and support staff</td>
<td>1000</td>
<td>8%</td>
</tr>
<tr>
<td>6</td>
<td>Email Generation</td>
<td>Generate automated emails to the references.</td>
<td>200</td>
<td>5%</td>
</tr>
</tbody>
</table>
According to COCOMO II estimate total pessimistic schedule excluding inception and transition phase it is 8.74 months (35 weeks). Since we have 12 weeks in this semester, it would not be feasible for the team to finish all the modules from the scratch.

NOTE:- The scale factor and cost driver details are mentioned in the LCP.
## Business Case Analysis

<table>
<thead>
<tr>
<th>Activities</th>
<th>Time Spent (Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exploration Phase</strong></td>
<td></td>
</tr>
<tr>
<td>Win-Win Negotiation Meetings (2 people * 4 hours + 3 people * 4 hours)</td>
<td>20</td>
</tr>
<tr>
<td>Communication with Development team (2 people * 2 hour)</td>
<td>4</td>
</tr>
<tr>
<td><strong>Valuation Phase</strong></td>
<td></td>
</tr>
<tr>
<td>ARB Meeting to review Progress</td>
<td>2</td>
</tr>
<tr>
<td>Identify missing scope or requirements with Development Team</td>
<td>10</td>
</tr>
<tr>
<td>Commit to Hardware/Software Costs of Project – meetings plus Communication</td>
<td>10</td>
</tr>
<tr>
<td><strong>Foundations Phase</strong></td>
<td></td>
</tr>
<tr>
<td>Assess Prototype and give feedback about Prototype</td>
<td>5</td>
</tr>
<tr>
<td>Plan for Development and Deployment of Project</td>
<td>40</td>
</tr>
</tbody>
</table>
Business Case Analysis

- **Development Phase**
  - Develop Release Plan with Developer Team 20
  - Develop Training Plan with Developer Team 20
  - Perform Core Capability Drive-Through 2
  - Give Feedback to Developer Team about Development iteration 10
  - Deployment of Web System plus database Connectivity with Developer Team 30
  - Provide Training for Support Staff & Background Investigators 40
  - Maintenance of Database plus Web Application (recurring cost) per year 104
    (2 hours/week * 1 person * 52 weeks)

- **Total (for one time costs)** 213
## Hardware and Software Costs

<table>
<thead>
<tr>
<th>Type</th>
<th>Cost</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hosting Web Server running Windows Server with IIS</td>
<td>2500</td>
<td>This is the server where the code will reside and where the users (both internal and external) will access the System <a href="#">Pricing link</a> (This is the average cost of a new HP Proliant Server running Windows 8)</td>
</tr>
<tr>
<td>Secure Socket Layer SSL Certificate (for one year)</td>
<td>1500</td>
<td>Required for secure connection from outside of the Web System <a href="#">Pricing Link</a> (Average cost of a one year SSL Certificate from VeriSign for Enterprise Users)</td>
</tr>
<tr>
<td>DMZ (De-Militarized Zone)</td>
<td>0</td>
<td>Network Security Setup needed (personnel cost for setting up subnet for Web Server) Assuming that the only set up required is that of the Router</td>
</tr>
<tr>
<td>Database Back-End DB2 instance which will allow for multiple connections</td>
<td>0</td>
<td>This is the database where all data will be stored (Assuming that the Web System’s data will be hosted on an already existing DB2 Database server which the Dept. of Public Safety will provide)</td>
</tr>
<tr>
<td>Disk Space to store Database Back-End DB2 data</td>
<td>0</td>
<td>This is the disk space that will be needed to store database data (This is assuming that an appropriate production database infrastructure is already set up at the Dept. of Public Safety)</td>
</tr>
<tr>
<td>Hosting Environment with connectivity to the Internet and World Wide Web</td>
<td>0</td>
<td>Networking and Internet Services Provider costs (This is assuming that a Hosting environment infrastructure is already set up at the Dept. of Public Safety for intake of applications via the web)</td>
</tr>
</tbody>
</table>

**Total Cost** $4000
# Quantitative Benefits

## Current Activities & Resources Used

<table>
<thead>
<tr>
<th>Activity Description</th>
<th>% Reduce</th>
<th>Time Saved (Hours/Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>For each candidate, create (type and print) one or multiple ‘Reference Request’ letters. Assuming 30 minutes for each application type and print, 2000* 30 minutes = 000 hours per year.</td>
<td>100</td>
<td>1000</td>
</tr>
<tr>
<td>Post each letter by mail to the Reference. Assuming 15 minutes to put reference form into envelope and carrying to be posted, 2000 * 15 minutes = 500 hours per year.</td>
<td>100</td>
<td>500</td>
</tr>
<tr>
<td>Gather (printed) Reference Request Responses in candidate physical folder. Assuming 15 minutes to open reference and properly file it, 2000* 15 minutes = 500 hours per year.</td>
<td>100</td>
<td>500</td>
</tr>
<tr>
<td>Track References and Reference Letters for candidates in candidate physical folder. Assuming 15 minutes to find candidate folder and find reference in folder by Background Investigator, 2000*15 minutes = 500 hours per year.</td>
<td>100</td>
<td>500</td>
</tr>
<tr>
<td>Assigning Candidates to Background Investigators. Assuming 10 minutes to assign candidates and noting assignment in Excel Spreadsheets, 2000<em>10 minutes, but since assignment still needs to be done, saving is 50 % of that which is 50/100 * (2000</em>10 minutes) = 167 hours.</td>
<td>50</td>
<td>167</td>
</tr>
<tr>
<td>Management of Background Investigators and Candidates (done by Managers). Assuming 20 minutes to change/re-assign candidates by looking up physical file and Excel Spreadsheets, 2000<em>20 minutes, but since re-assignment decisions still need to be made, saving is 80 % of that which is 80/100 * (2000</em>20 minutes) = 533 hours.</td>
<td>80</td>
<td>533</td>
</tr>
</tbody>
</table>
Cost Benefit Analysis Worksheet

- In our Win-Win negotiations, the Dept. of Public Safety estimated that they process 2000 (two thousand) applications per year. The values for the benefits derived are based on this number.

- **Nonrecurring Costs**
  - System Development & Deployment $8520
    - ($40 per hour, total costs = 213 * 40 = $8520)
  - Hosting Web Server $2500
  
  **Total** $11020 per year

- **Recurring Costs**
  - Server Maintenance Personnel Cost $4160 per year
    - (104 hours per year * $40 per hour = $4160 per year)
  - SSL License $1500 per year
  
  **Total** $5660 per year

- **Tangible Benefits**
  - Cost Avoidance $48000 per year
    - (3200) * $15 / hr on average = $48000 per year

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## ROI Analysis

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost</th>
<th>Benefit (Effort Saved)</th>
<th>Cumulative Cost</th>
<th>Cumulative Benefit</th>
<th>ROI</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>11020</td>
<td>0</td>
<td>11020</td>
<td>0</td>
<td>-1</td>
</tr>
<tr>
<td>2014</td>
<td>5660</td>
<td>48000</td>
<td>16680</td>
<td>48000</td>
<td>1.87</td>
</tr>
<tr>
<td>2015</td>
<td>5702</td>
<td>48000</td>
<td>22382</td>
<td>96000</td>
<td>3.28</td>
</tr>
<tr>
<td>2016</td>
<td>5745</td>
<td>48000</td>
<td>28127</td>
<td>144000</td>
<td>4.11</td>
</tr>
</tbody>
</table>

### Return On Investment

![Graph showing the ROI analysis over years]
## Risk Assessment

<table>
<thead>
<tr>
<th>Risks</th>
<th>Risk Exposure</th>
<th>Risk Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of LDAP for authentication and authorization of users</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Use of ColdFusion as a development framework</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Use of DB2 as the back-end database for the system</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Need to be able to give privileges to an ‘administrator’ or a group of administrators who can add/delete investigators from the system. High Operational clarity needed</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Need to be able to securely log in to the system. High legal liability and highly reliable technology</td>
<td>9</td>
<td>7</td>
</tr>
</tbody>
</table>
NDI/ NCS Interoperability

- **Development Framework**: ASP.NET MVC Framework
- **Connectors**: ODBC/DB2 Connector to connect to DB2
- **Legacy Systems**: DB2

In this project, the developed system should be able to authenticate administrators, investigators and support users based on an already existing LDAP system used by the Dept. of Public Safety.

<table>
<thead>
<tr>
<th>NDI</th>
<th>Usages</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASP.NET MVC Framework</td>
<td>Develop screens and workflow of site</td>
<td><strong>Positives</strong>&lt;br&gt;-Some Developers are familiar with ASP.NET and C#&lt;br&gt;-Dept. of Public Safety has agreed to allow development in ASP.NET/C# instead of ColdFusion which no developer is familiar with&lt;br&gt;<strong>Negatives</strong>&lt;br&gt;-Developers are mostly familiar with Java and thus need to take training for ASP.NET (and C#) to be able to effectively develop the code</td>
</tr>
<tr>
<td>Salesforce.com</td>
<td>Develop system on the salesforce.com platform</td>
<td><strong>Positives</strong>&lt;br&gt;-platform has most of the functionality built and can be developed quickly&lt;br&gt;<strong>Negatives</strong>&lt;br&gt;-Dept. of Public Safety does not want the data for the system stored outside the systems in their datacenter</td>
</tr>
</tbody>
</table>
Traceability Matrix
# Traceability Matrix

<table>
<thead>
<tr>
<th>Operational Concepts</th>
<th>Requirements/ Win Conditions</th>
<th>Architecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>OC-1</td>
<td>WC_2395</td>
<td>UC – Support Staff Module</td>
</tr>
<tr>
<td>OC-2</td>
<td>WC_2394, WC_2407</td>
<td>UC – Reference USCD</td>
</tr>
<tr>
<td>OC-3</td>
<td>WC_2393</td>
<td>UC - Investigator Module</td>
</tr>
<tr>
<td>OC-4</td>
<td>WC_2404</td>
<td>UC - Investigator Module</td>
</tr>
<tr>
<td>OC-5</td>
<td>WC_2583, WC_2454</td>
<td>UC – Manager Module</td>
</tr>
<tr>
<td>OC-6</td>
<td>WC_2586, WC_2396, WC_2402</td>
<td>UC – Investigator Module</td>
</tr>
<tr>
<td>OC-7</td>
<td>WC_2453</td>
<td>UC – Manager Module</td>
</tr>
</tbody>
</table>
Quality Management
Defect Identification

Artifact Defect Identification and Management

- Peer Review
  - Informal peer/buddy review done during artifact creation and feedback given instantly during meetings
- Formal Review done by IIV&V individual
- Bugzilla
  - Used to identify tasks and identify defects with each task
- Artifact version used to identify major changes to the artifact

Other Tools Used for Artifact Defect Management

- Email
Defect Injection and Removal (Resolved Defects - Bugzilla)
Defect Injection and Removal (Total Defects - Bugzilla)
Quality/Configuration Management Strategy

Techniques/Tools Used for artifact configuration management
• Follow artifact template guidelines where provided.
• Use version in document title to identify version of document plus adding Version summary to the top of each document.
• Use Bugzilla ticket plus comments in ticket to track changes to the document for each phase.

Techniques/Tools being considered for Product Quality/Configuration management
• Use ‘Buddy/Peer Review’ for reviewing and testing code to fix defects.
• Use GitHub to track version of product
• Use Bugzilla to track each defect
Thank You

Q & A