

# Union Pacific Multimedia Wall CyRIS (May15-19) Project Plan

## Team Members:

Randy Groh  
Alex Haynes  
Brandon Kuha  
Brylee Raupp-Timmons  
Ian Rosenbery  
Maria Vognsen  
Aaron Zatorski

## Advisors:

Dr. Manimaran Govindarasu  
Brock Ascher

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# I. Executive Summary

At the current time, the interactive wall is a group of 12 (4 wide x 3 tall) - 55in LED displays that are linked together to create a larger display. The Union Pacific Multimedia Wall, also known as CyRIS, is the name of this display and project. Currently, the display does not utilize the interactive potential that the hardware possesses and lacks “curb” appeal that gets potential users interested. The design objectives for this project are as follows:

1. Effectively utilize the Intuiface software
2. Integrate the previous team’s Bus Mapping Application into Intuiface
3. Develop and implement new applications utilized by users
  - a. Ticker App for Lab Information
  - b. Stellarium
    - i. New Screensaver
    - ii. Application
  - c. Music Machine
  - d. Directory Search
  - e. Club & Research Spotlight | CMS
  - f. Daily Brain Bytes
4. Develop a creative interface that attracts users
5. Modularize progress for future groups

The team has created a general plan for being successful in completing the project goals. The first step is to get-to-know the Intuiface software so that the team can further utilize it to develop new applications and understand the possibilities. Through this process, the team will be able to discover if what is desired is feasible or not. With knowledge of the capabilities, the team can then further develop a plan more accordingly in order to create more comprehensive requirements. Once the team starts creating applications that meet requirements, the team will test frequently and fix any errors or bugs that arise. When everything is done, the team will have a finished product that can be displayed on the wall for everyone to use.

Currently, the team is in the process of understanding how to create widget type solutions for the Intuiface software and attempting to resolve a couple of the previous team’s difficulties with the real time bus mapping application. After collaboration with the previous team, lack of a reusable codebase leaves the team without all, except the mapping application, of the previous team’s applications. As a result, the team is moving

forward with its own new applications. Based on the progress made: wall response times, calibration and accuracy, hardware limitations, and processing times will limit the possible component functionality. The next steps are to discover ways to make custom Intuiface assets, interface with lab monitoring tools in Coover, and develop “lighter” processing components for InCadence. Following steps will be to deploy the bus maps application, continue experimenting, developing, and testing new designs and applications, integrate them into Intuiface and begin user testing with the ultimate goal of full deployment.

## II. Project Plan

The team's overall goal is to create a more appealing interface that meets modern expectations. The goal will be achieved by creating several applications for the CyRIS wall that will induce ISU students' and by-passers' curiosity about the display. These applications will create an intuitive, interactive, entertaining, and informative experience. The applications will be constructed in such a way that users can find desired information quickly or experience an engaging diversion.

The team's plan is to research ways of embedding applications into the Intuiface platform so that all applications are cohesive. After discovering different ways to do this, the team will research ways to create a more intuitive and useful interface that involves all the available applications. Being able to launch available applications from the main display with minimum navigation and delay is our ideal approach. Being able to research and development new applications effectively will be the team's major goal in order to be successful. If new ideas, research or possibilities arise that could potentially provide value, the team will discuss and decide if and/or how it can be included into the team's overall goal.

## III. Problem Statement

The current interface and content displayed on the CyRIS wall is uninteresting, unintuitive, sluggish, and lacks to demonstrate the interactive potential that the hardware can provide. The goal is to create new applications that will take advantage of the hardware's potential, as well as be easily discoverable and managed by future teams and project owners. All new applications will be integrated into the current system, or newly updated system, when finished, if feasible.

## IV. Solution/Procedure Statement

To be successful in reaching the team's goals of making a more interactive and desirable wall, the team will take the current system and:

1. Get familiar with the existing software and hardware
  - a. Discover the capabilities and restraints of the existing system
  - b. Determine what existing apps as well as new apps are feasible with the media wall's and Intuiface's framework.
2. Determine application requirements
  - a. Based on the team's observations of the wall's current usefulness
  - b. Informal evaluation of bypassers' reflections of the wall
  - c. Based off the current shortcomings
3. Develop new look for CyRIS
  - a. Develop a new interface that has more "curb appeal"
  - b. Develop several applications that increase the wall's usability
4. Testing new developments
  - a. Test in-progress applications on test system
  - b. Test completed applications on full CyRIS system
  - c. Test applications with real users
5. Deploy finished developments to the production CyRIS system

## V. Intended Users

The intended users will be:

1. Coover Staff
  - a. Administrative staff
  - b. Faculty
  - c. Content Managers
2. Students and Families
  - a. College visitors
  - b. Engineering students
  - c. Bypassing students
3. Project, Research & Club Leaders

## VI. Deliverables

### a. Apps to Revise / Maintain

#### i. Campus Map with CyRide Integration

1. An interactive map of the Iowa State University campus with live data about the CyRide bus system. The user can select a route and a building location to see upcoming arrival times.

#### ii. Front Page

1. The layout and appearance of the main page of the wall will be updated to include icons for launching the existing and newly deployed applications, and widgets for those without an icon.

#### iii. Launch Applications in a better fashion

1. Rather than transition from Intuiface to a java application and then back when it exits, all applications moving forward will be developed and executed within the Intuiface framework.

### b. Apps to Develop

#### i. Ticker

1. The ticker app shows available workstations in Coover Hall by leveraging the LabStats API. It Dynamically updates. Shows the available labs per hour and which stations are available in the open labs.

#### ii. Stellarium Screensaver

1. The wall uses the open source project Stellarium to provide a map of current constellations visible from Ames, Iowa as a screensaver.

#### iii. Stellarium Application

1. The Stellarium Application utilizes open source code that allows a user to view constellations from the wall's current geo-location, other hemispheres or cultures and interact with the night sky. Users can view details about the constellations and learn about the universe.

#### iv. InCadence (Music Machine)

1. The Music Machine application allows one or two users to drag an instrument into the play area and play music. Users can record their performance and save it on the wall. Users can click recordings and listen to past demonstrations. Users can vote on recordings and track their stats on the leaderboard.

v. Club & Research Spotlight | CMS

1. The Club & Research Spotlight shows showcased content submitted to the department such as research projects ongoing in the department or projects being undertaken by engineering clubs. Student newsletter could also be a source of information or stories, and the application is sufficiently flexible to support the display of many types of content and media.

vi. Daily Brain Byte

1. This widget will display daily updated text or images that is pulled from various sources. This content could be a quiz, fact, engineering puzzle/problem, or tech / science joke. These can be submitted by students as well as pulled from online databases.

vii. Directory Search

1. The Directory Search application allows a user to do an alpha search for any ISU faculty or students for various information (contact, phone number, any available info on ISU directory site) using a text-input solution. This search is campus wide and not limited to Coover hall.



## VII. Requirements, Constraints & Dependencies

### Ticker

Details: The ticker app shows available workstations by leveraging the LabStats API. Live/dynamically updates. Shows the available labs per hour and which stations are available in the open labs.

#### Functional Requirements:

Display available labs with details: Number open stations, OS, etc.

Contains schedule of the labs (future free times)

Scrollable list

Scalable sizes via pinch or button (a method to be determined)

Sortable (OS, Floor, building, availability)

#### Non-functional Requirements:

LabStats API must poll new data every 5 min.

Scalable with minimal quality loss (3/4 screen size MAX)

Sort within 1 sec

#### Constraints:

Application is constrained by the labs that are currently available on LabStats.

#### Dependencies:

Application depends on third party's ability to update the data in the LabStats API in real time.

Dependent on the lab having working hardware to update information.

### Stellarium Screensaver

Details: The wall uses the open-source project Stellarium to provide a map of current constellations visible from Ames, Iowa as a screensaver.

#### Functional Requirements:

Stop screensaver on touch (Message, "Touch to Start").

Screensaver shows user current constellation based on location.

Screen saver isn't interactive except for single touch to exit.

#### Non-functional Requirements:

Dynamically start each night at sunset and 5 min of inactivity has been reached during sunset to sunrise.

Dynamically stop each morning at sunrise.

On touch should start main display within 2 sec

Constraints:

By Intuiface's ability to embed applications into their interactive spaces.

By Intuiface's ability to dynamically change content based on new info or time.

Dependencies:

Dependent upon the open source code and its working functionality.

Back-end servers sending data about satellite and constellation information.

## Stellarium Application

Details:

App utilizing an open-source project that allows a user to view constellations from current geo-location, other hemispheres or cultures and interact with them. View details about the constellations and navigate around them.

Functional Requirements:

Be able to view an interactive constellation based on various locations, cultures and details.

Launch covers entire screen

Can get back to home screen from within application

Non-functional Requirements:

App should always be in English.

App updates view on every user prompt - real time

Constraints:

By Intuiface's ability to embed applications into their interactive spaces.

By Intuiface's ability to dynamically change content based on new info or time.

Dependencies:

Dependent upon the open source code and its working functionality.

Back-end servers sending data about satellite and constellation information.

## InCadence (Music Machine)

### Details:

Application allows one or two users to drag out an instrument to play area and play music. Users could record their playing and save it on the wall. Passing users could click recordings and listen. Vote up and down possible.

### Functional Requirements:

Users can hear the notes played real time

Users can play two instruments (piano and drums)

Users can record

Users can play a recording back

Users can stop a playback.

Show a loading animation during playback load

Administrators can delete any recording if necessary.

Users can up or down vote.

Organize recordings by vote.

Name recording.

Demo playback.

### Non-functional Requirements:

Notes being playback are loaded from midi file in realtime

Capable of playing two instruments at the same time without delay

Users can save recording for a maximum of 1 min.

Users can save recording of a minimum time of 8 secs.

Playback loading 5 seconds wait time max

Playback stop instantaneous

Users can only up or down vote a recording once per full length of the playback

Organizing is updated real time per vote

Name recordings using selected dictionary of valid and relevant appropriate words

Demo playback of at least 16 secs.

Wall IR sensor constraint (Minimize Touch Delay)

### Constraints:

By Intuiface's ability to embed applications into their interactive spaces.

By the response times of the IR sensors.

By the accuracy of the IR Sensors.

By the CPU and Memory usage available in the hardware

Dependencies:

The operating state that the sound hardware is in.

## Directory Search

Details:

Allows a user to do an alpha search for any ISU faculty or students for various information (contact, phone number, any available info on ISU directory site) using a text-input solution.

Functional Requirements:

Switch between faculty and student search

Search alpha A-Z

Search through text-input solution

Display Faculty or student info such as Name, Availability, email, department and anything available on the normal ISU directory search.

Non-functional Requirements:

Input solution does not have accessible hot keys or window keys

Searches complete within time constraint of ISU network

Constraints:

The level of access we have to the API used by ISU directories

Dependencies:

Dependent on the ISU directories being updated by some third party.

## Club & Research Spotlight | CMS

Details: shows users showcased content such as research projects ongoing in the department or projects being undertaken by engineering clubs. Student newsletter could be a source of information or stories?

Functional Requirements:

Stories contain description, images, titles, video, and author

Stories can be submitted through a web based content management system

Stores are scrollable

Stories are selectable

Images in stories can be zoomed (Facebook-like overlay)

Links to engineering club pages can be clicked. (Might present a security vulnerability)

#### Non-functional Requirements:

Images zoom (and de-zoom) within 1 second  
Stories load within 2 seconds  
Scalable with minimal quality loss (3/4 screen size MAX)  
Scrolling is smooth

#### Constraints:

By the extent that Intuiface allows you to make custom viewers.

#### Dependencies:

Would be dependent upon some content management system that would have to be managed by a third party.

#### Daily Brain Bytes

Details: This widget will display daily updated text that is pulled from various sources. This text includes possibly a quiz, fact, engineering puzzle/problem, tech / science joke. This could be submitted by students.

#### Functional Requirements:

The content will be easy to read and unobtrusive to the main display  
Content can be submitted through a web based content management system

#### Non-functional Requirements:

New content will be polled at midnight each day.  
If content is unreachable the application will hide the chrome for that content.

#### Constraints:

N/A

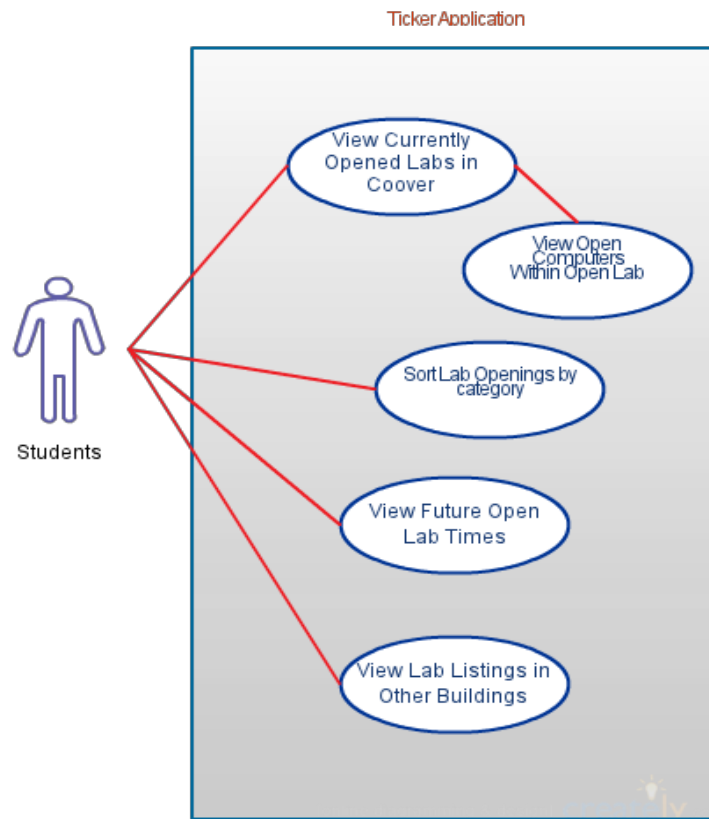
#### Dependencies:

Dependent on third party's updating frequency of the RSS Feeds we would use.  
Dependent on students submissions of various jokes and infos.  
Dependent on some third party content management system to manage student submissions.

## VIII. Use Cases

### Ticker

- User can select lab to view future open times
- User can scroll through lab listings



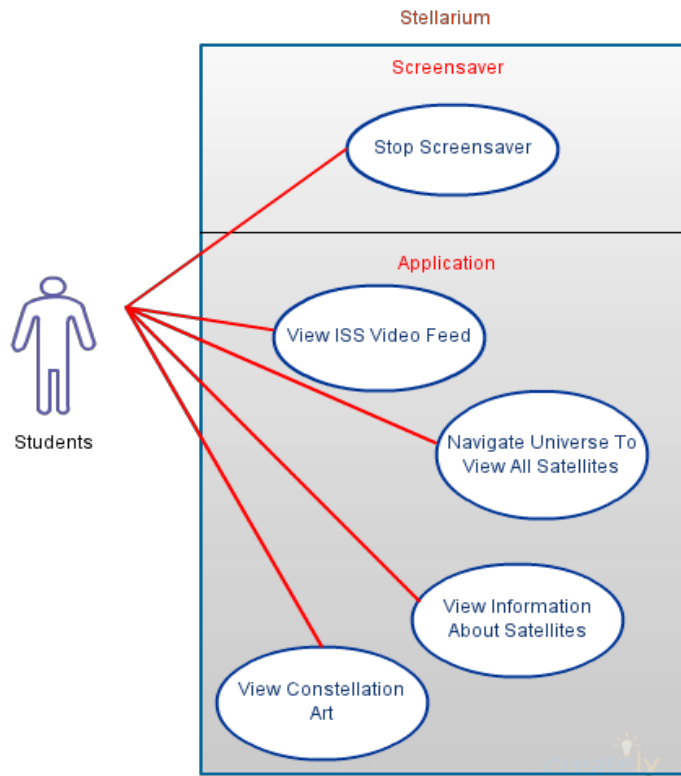
### Stellarium Screensaver

- User touches screen saver to close screensaver

### Stellarium Application

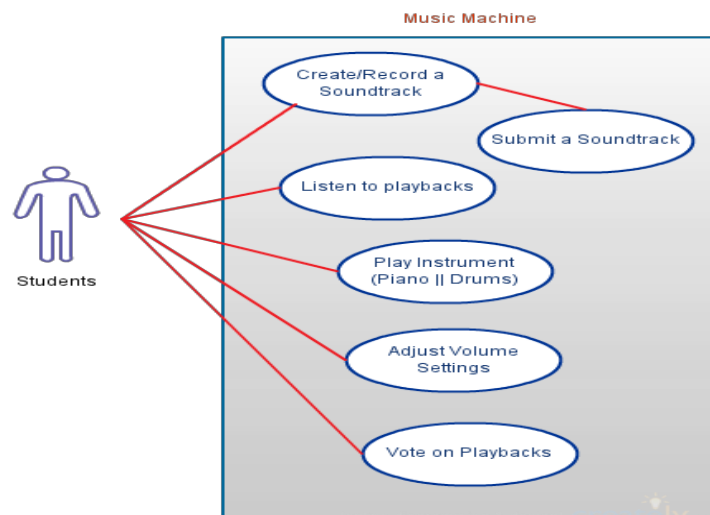
- Goal: Edit Viewing Options
  - User can view all constellations in the cosmos
  - User can swipe the globe-view left or right to rotate and view more constellations
  - User can tap on a constellation and receive information about it.
  - User can tap on a star or satellite to receive information about it.
  - User presses constellation art button to turn art on/off
  - User presses constellation line button to turn constellation lines on/off

- User presses constellation labels button to turn constellation lines on/off
  - User changes global viewing location through location menu
  - User views deep sky objects by pressing button
  - User centers on selected object by pressing button
  - User can view satellite orbits by pressing satellite hints button
- Goal: Edit Configuration Options
- User changes viewing data and time via date and time menu
  - User edits view settings through sky and viewing options menu
  - User edits configuration through configuration options menu
- Goal: Search for celestial body
- User searches for specific celestial body through search window



## InCadence (Music Machine)

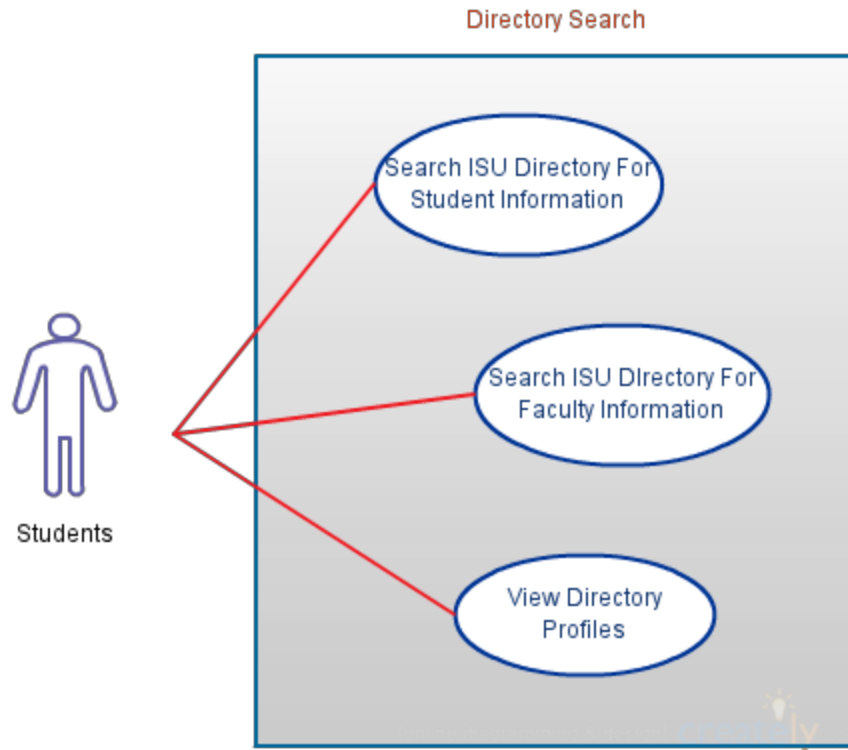
- Goal: Create own instrument(s) soundtrack and save for peer listening
  - User launches application by touching icon
    - Exception: Application could have been previously launched and no launch is necessary
  - User brings instrument(s) into playing area via a swipe on the touch screen
    - Extension: User removes instrument(s) from playing area via a swipe on the touch screen
  - User presses the “record” icon via touch screen to begin recording
  - User “plays” instrument(s) via touch screen presses
  - User presses the “stop” icon via touch screen to end recording
    - Exception: The user exceeds time limit for recording and “recording mode” ends
    - Extension: User presses the “play” icon via touch screen to review recording
  - User presses the “save” icon via touch screen to submit recording
  - User presses the “exit” icon via touch screen to exit application
- Goal: Listen to submitted recordings and vote on preferences
  - User launches application by touching icon
  - User scrolls through saved tracks via touch screen
  - User presses the “playback” icon via touch screen to start individual playback
  - User listens to playback
  - User presses the “up vote” icon via touch screen to give recording a point
  - User presses the “exit” icon via touch screen to exit application





## Directory Search

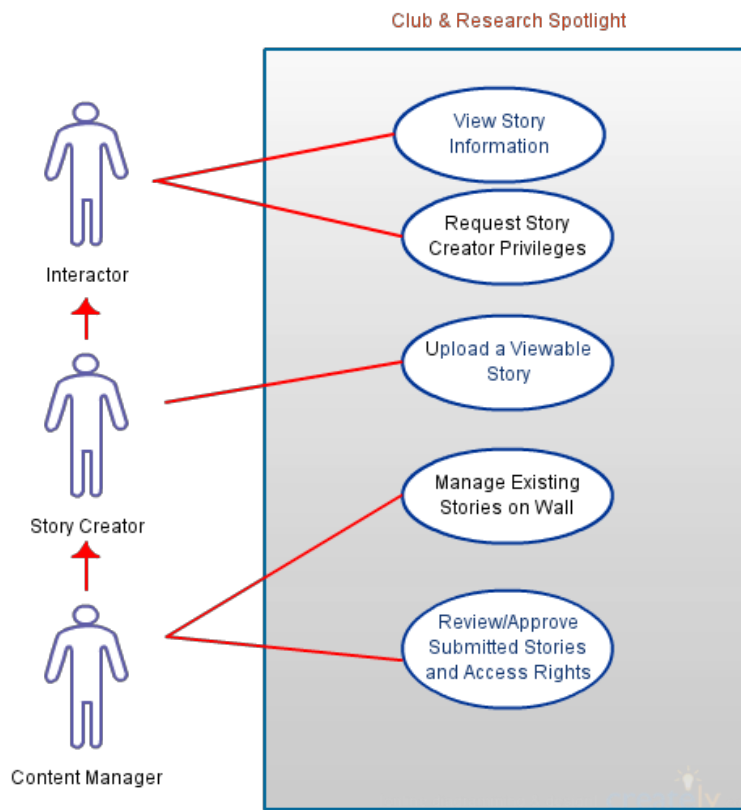
- Search the CPRE directory (student and faculty)
- Select and view directory profiles



## Club & Research Spotlight | CMS

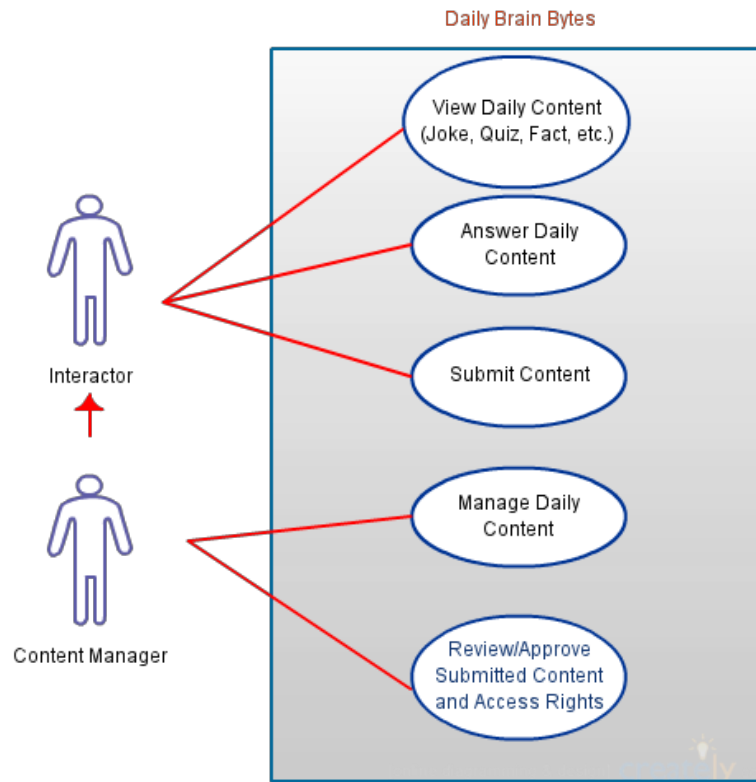
- Goal: Upload a story to be reviewed for the wall
  - User loads web application via browser
  - User signs into web application
  - User enters text into text boxes
  - User uploads pictures from computer
  - Optional: User uploads video from computer
  - User submits story by a “submit” button
  - User logs out of web application
- Goal: Review a submitted story to place on wall
  - Admin loads web application via browser
  - Admin signs into web application
  - Admin clicks “review submissions” button
  - Admin selects story from list
  - Admin reviews story

- Admin clicks “approve” or “disapprove” based upon decision
- User logs out of web application
- Goal: Manage existing stories on wall
  - Admin loads web application via browser
  - Admin signs into web application
  - Admin clicks “currents stories” button
  - Admin reviews list of current stories
  - Admin removes existing stories by clicking “X” button
  - Admin clicks “delete” button on confirmation popup
  - User logs out of web application
- Goal: View stories on wall
  - User scrolls through stories on wall via touch screen
  - User selects story by touch
  - User views story
    - Expansion: User touches photo and it expands to screen
    - Optional: Expansion: User touches video and it expands and plays on screen
  - User closes story by touching “X” icon



## Daily Brain Bytes

- User can view content and interact by reading a joke or daily fact
- User can interact with content (quiz or puzzle) by selecting multiple choice answer via touch



## IX. Project Schedule

	Task Name	Start	Finish	Q3			Q4				Q1			Q2		
				Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
1	Familiarization with Phase 1	09/17/14	09/30/14			■										
2	App Maintenance discovery	10/01/14	10/08/14				■									
3	Improving Existing Applications	10/08/14	10/15/14				■									
4	App maintenance discovery - Round 2	10/15/14	10/22/14					■								
5	Improve existing applications - Round 2	10/22/14	10/31/14					■								
6	Implementation of UI layout / App Testing	11/01/14	11/17/14						■							
7	Testing, Development, Presentation	11/17/14	12/01/14						■							
8	Mistakes / Challenges unforeseen	12/01/14	01/16/15							■	■					
9	Bugs being addressed	01/12/15	01/19/15								■					
10	Retrospection on previous semester	01/12/15	01/19/15								■					
11	Start developing new apps	01/19/15	01/30/15									■				
12	Development of new apps	02/01/15	04/01/15										■	■		
13	User testing / breaking things	04/01/15	04/13/15												■	
14	Revisions based on results	04/13/15	04/24/15													■
15	Deployment, final documentation, pres.	04/25/15	05/15/15													■

## X. Project Tracking Procedures

To maintain clarity and cohesion as the project progressed, the team meets weekly in either the Senior Design Lab or a Collaborative Learning Space in Durham. Weekly meetings with the group adviser provide guidance and help the team discuss the status and redefine goals. The use of the Combine board service Trello helps the team track Dev Tasks and the progress of individual team members. The team leverages the group texting service GroupMe for project related messaging.

## XI. Risks

Running java applications inside Intuiface

The previous team for this project launched their applications as separate java applications instead of being attached to Intuiface. A major goal for this project is to merge past and future applications with Intuiface; failure to find a good way to do this would be a major setback.

**Risk mitigation:** All java code will need to be linked with intuiface through Javascript. This is the only way to actually have applications run on top of the intuiface “framework”. In this way, the CyRIS wall will have a home screen with app icons that users will then be able to click to launch each app separately.

IR Beam limitations on user input

Using IR beams to detect the user input has a sizeable delay when compared to modern touch screens. This may inhibit the team's ability to make applications requiring rapid user input. Some applications may also feel slow or unresponsive if this isn't accounted for.

Risk mitigation: Perform a hardware analysis with guidance from Jason Boyd. This will help to determine the root cause of the lag. After discovering the issue, proper steps can be taken to correct it if feasible.

Integrating previously implemented code

Previous code has no documentation and it doesn't check its dependencies.

Risk mitigation: Fully understand old code before beginning development. Add sanity checks for all URLs and database calls.

## XII. Estimated Resource Costs

<b>Resource</b>	<b>Estimated Price</b>
Intuilab Enterprise Edition License - Composer	\$996/year
Intuilab Enterprise Edition License - Windows Player	\$310/year

### XIII. Security, Privacy, and Technology Considerations

The CyRIS project has various security and technology considerations that arise when developing new applications and interfaces for the current system. Users will be interacting with the wall everyday and at any given time in the day. This includes possible times occurring in the middle of the night. To prevent security breaches, we need to limit the users from accessing system features that are not intended for public use.

The CyRIS system is running on a normal windows host machine so the possibility of accessing the windows system through the windows on-screen keyboard is evident. To ensure the CyRIS wall is only used for its intended purpose, we will disable the on-screen keyboard removing any possible hotkeys that would allow a user to do malicious activities. Other system interaction will be obtained strictly through remote access to help maintain the overall security.

An additional reason for disabling system features for public use is to help avoid privacy issues. If the ability to use the web browser, for example, was allowed, potential threats to privacy as well as limitless opportunities for malicious activity could arise. By limiting what a user can do on the wall, their privacy is being protected by preventing them from doing innocent activities such as checking email that could result in leaked personal information.

One technology consideration involves possible issues with the display resolution of the multimedia wall. The screen resolution and the server's output to the display are important factors to the overall success of the CyRIS project. The currently installed hardware is unable to display a full-screen video because the display's resolution is much greater than that of the server's output. This is important because of the vast amounts of graphics, videos and pictures that are desired to be displayed on the wall.

## XIV. Tasks and Responsibilities

- a. Randy Groh - Team Leader
  - i. The Team Leader will liaise between the senior design team and the client as well as be the main contact for the department advisor.
  - ii. CMS | Club & Research Spotlight
  - iii. Daily Brain Byte
- b. Alex Haynes - Penetration Tester & Brainstorm Dynamo
  - i. The Brainstorm Dynamo will generate creative ideas and features for both existing applications and new programs to develop. This member must be careful both to neither dismiss new ideas out of hand, or be sensitive to valid concerns about the viability of new concepts.
  - ii. Directory Search
  - iii. Ticker
- c. Brandon Kuha - Webmaster
  - i. The Webmaster creates and manages the team website. The site contains the weekly project reports and will be the main reference for the project.
  - ii. CMS | Club & Research Spotlight
  - iii. Daily Brain Byte
- d. Ian Rosenbery - Code Tester/Evaluator
  - i. The Code Tester/ Evaluator determines how robust and user-proof an application is. He or she will stress the system and push it to the limit, checking edge and corner cases to see if the applications become unresponsive or behave improperly. Bugs discovered will be reported along with reproduction steps to limit the showstopper errors that make it to deployment.
  - ii. Music Machine
  - iii. Stellarium Application
- e. Brylee Raupp-Timmons - Key Concept Owner
  - i. The Key Concept Owner has a strong vision for the project and knows what needs to be done next. They keep the group on task and make the team aware when resources are being expended incorrectly.
  - ii. InCadence (Music Machine)
- f. Maria Vognsen - Key Concept Owner
  - i. The Key Concept Owner has a strong vision for the project and knows what needs to be done next. They keep the group on task and make the team aware when resources are being expended incorrectly.
  - ii. Ticker

- g. Aaron Zatorski - Communications Director
  - i. The Communications Director drafts communiques, prepares the weekly team reports, and has final say in the formatting of all documentation and written dialogue. They are responsible for collating and organizing the paperwork behind the project in order to track progress and facilitate retrospective analysis.
  - ii. Stellarium Screensaver
  - iii. Stellarium Application

## XV. References

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