



# DEPARTURES

TIME	DESTINATION	FLIGHT	GATE	REMA
12:39	LONDON	CL 903	31	CANC
12:57	SYDNEY	UQ5723	27	CANC
13:08	TORONTO	IC5984	22	CANC
13:21	TOKYO	AM 608	41	DELA
13:37	HONG KONG	IC5471	29	CANC
13:48	MADRID	EK3941	30	DELA
14:10	REPUBLIC	AK5021	28	CANC
14:25	NEW YORK	ON 997	11	CANC
14:34	PARIS	KG5870	23	DELA
15:10	ROME	RI5324	43	CANC

Data-Driven Display  
Interaction Design Studio  
October 2018

Lisa Carter · Vivian He · Kevin Seelaus · Wilson Yu

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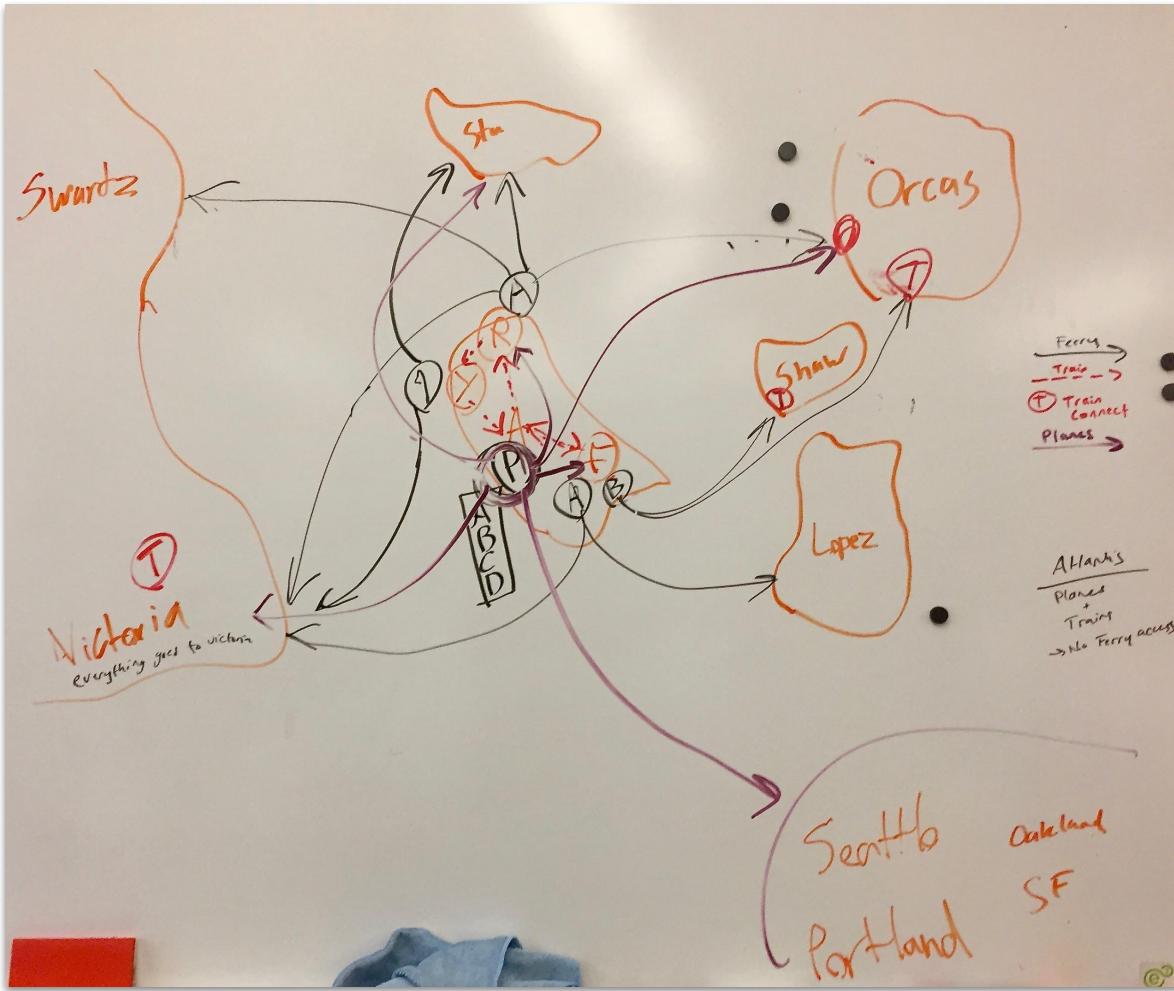
# Project Briefing



Our team was tasked with designing a digital display for the Atlantis Transportation Hub in the San Juan Islands. The display would manage data updates for ferry, plane, and train data, providing visitors with the necessary information to travel seamlessly between the several islands.

Plane	Aircraft												Ferry											
Flight	Destination	ID Number	Gate	Departure Time	Status	Fuel hours onboard	Manufacturer	MTOW (Maximum Takeoff Weight)	Flight, Ferry	Train Packag	Operator	Airline	Airline Code	Accounting Code	Departure from	Departure Time	Board at Dock	Destination	Arrival Time	Rental Car	Train Connection	Car Connection		
Seattle	1211	C10	6:15	Departed	9.75	MD	22,760	N	United Airlines	UA	16	Friday Harbour	10:00 AM	A	Lopez Island	10:25 AM	2	No	2					
Friday Harbour	1121	A1	6:17	Delayed	9.13	Boeing	27,750	N	American	AA	001	Friday Harbour	10:15 AM	B	Shaw Island	10:45 AM	2	Yes	2					
Friday Harbour	32	C12	6:18	Delayed	8.78	Boeing	20,400	Y	Southwest	WN	526	Friday Harbour	10:30 AM	A	Victoria	11:05 AM	5	Yes	3					
Seattle	1212	C14	6:18	Delayed	7.73	MD	23,000	N	United Airlines	UA	16	Friday Harbour	11:00 AM	B	Orcas Island	11:20 AM	2	Yes	2					
Victoria	431	C18	6:18	Delayed	7.28	Airbus	28,500	N	Delta Airlines	DL	006	Friday Harbour	12:05 PM	A	Lopez Island	12:25 PM	2	No	2					
Seattle	5435	C29	6:44	On Time	8.12	Airbus	27,568	N	Virgin America	VX	984	Friday Harbour	12:15 PM	B	Shaw Island	12:45 PM	2	Yes	2					
Seattle	5433	C27	6:47	Boarding	7.98	MD	28,500	N	Virgin America	VX	984	Friday Harbour	12:30 PM	A	Victoria	1:05 PM	5	Yes	3					
Victoria	4123	C21	6:55	On Time	5.25	Umbro	16,750	N	Delta Airlines	DL	006	Friday Harbour	1:00 PM	B	Orcas Island	1:20 PM	2	Yes	2					
Orcas Island	8341	B3	6:57	Boarding	3.50	Cessna	7,000	Y	San Juan Air	SJ	097	Friday Harbour	2:05 PM	A	Lopez Island	2:25 PM	2	No	2					
Roche Harbour	1001	A11	7:01	Delayed	4.28	Airbus	22,450	N	American	AA	001	Friday Harbour	2:15 PM	B	Shaw Island	2:45 PM	2	Yes	2					
Roche Harbour	3215	D11	7:01	Boarding	4.28	Airbus	28,500	Y	Southwest	WN	526	Friday Harbour	2:30 PM	A	Victoria	3:05 PM	5	Yes	3					
Seattle	8901	A9	7:15	On Time	3.75	Umbro	16,750	N	American	AA	001	Friday Harbour	2:45 PM	B	Shaw Island	2:45 PM	2	Yes	2					
Seattle	4107	D16	7:15	Boarding	3.75	MD	22,000	N	Southwest	WN	526	Friday Harbour	3:00 PM	A	Victoria	3:05 PM	5	Yes	3					
Portland	5439	C26	7:21	On Time	7.75	Airbus	28,500	N	Virgin America	VX	984	Friday Harbour	3:05 PM	B	Orcas Island	3:20 PM	2	No	2					
Stuart Island	7602	A27	7:23	On Time	4.13	MD	28,000	N	American	AA	001	Friday Harbour	4:30 PM	A	Victoria	5:05 PM	5	Yes	3					
Stuart Island	4109	D14	7:23	On Time	4.13	MD	22,760	Y	Southwest	WN	526	Friday Harbour	5:00 PM	B	Orcas Island	5:20 PM	2	Yes	2					
Orcas Island	7689	A29	7:30	Cancelled	4.00	MD	28,000	N	American	AA	001	Friday Harbour	6:05 PM	A	Lopez Island	6:35 PM	2	No	2					
Orcas Island	3556	D15	7:30	On Time	4.00	Umbro	23,000	Y	Southwest	WN	526	Friday Harbour	6:15 PM	B	Shaw Island	6:45 PM	2	Yes	2					
Friday Harbour	8009	B1	7:32	Boarding	2.25	Cessna	7,000	Y	San Juan Air	SJ	097	Friday Harbour	6:30 PM	A	Victoria	7:05 PM	5	Yes	3					
San Francisco	1268	C12	7:37	On Time	8.75	Boeing	21,980	N	United Airlines	UA	16	Friday Harbour	7:00 PM	B	Orcas Island	7:20 PM	2	Yes	2					
Seattle	1001	C1	7:50	On Time	4.50	Boeing	27,750	N	Delta Airlines	DL	006	Friday Harbour	8:05 PM	A	Lopez Island	8:35 PM	2	No	2					
Roche Harbour	8686	B2	8:10	Delayed	2.75	Cessna	7,000	Y	San Juan Air	SJ	097	Friday Harbour	8:15 PM	B	Shaw Island	8:45 PM	2	Yes	2					
Stuart Island	1881	C10	8:10	Delayed	2.75	Cessna	7,000	Y	Spirit	NK	487	Friday Harbour	8:30 PM	A	Victoria	9:05 PM	5	Yes	3					
Stuart Island	8943	B8	8:35	On Time	3.25	Beechcraft	12,000	Y	San Juan Air	SJ	097	Friday Harbour	9:00 PM	B	Orcas Island	9:20 PM	2	Yes	2					
Stuart Island	1882	C9	8:35	On Time	3.25	Beechcraft	12,000	Y	Spirit	NK	487													
Friday Harbour	8331	B1	8:36	On Time	3.00	Beechcraft	11,500	Y	San Juan Air	SJ	097	Roche Harbour	6:00 AM	A	Orcas Island	6:35 AM	No	1	1					
Friday Harbour	1885	C13	8:36	On Time	3.00	Beechcraft	11,500	Y	Spirit	NK	487	Roche Harbour	7:00 AM	A	Victoria	7:45 AM	Yes	3	1					
Orcas Island	8332	B2	8:40	On Time	2.75	Beechcraft	9,750	Y	San Juan Air	SJ	097	Roche Harbour	8:00 AM	A	Stuart Island	8:35 AM	No	1	1					
Friday Harbour	1884	C7	8:40	On Time	2.75	Beechcraft	9,750	Y	Spirit	NK	487	Roche Harbour	9:00 AM	A	Swatz Bay	9:25 AM	No	1	1					
Portland	5419	C31	8:45	On Time	8.23	Boeing	28,500	N	Virgin America	VX	984	Roche Harbour	10:00 AM	A	Orcas Island	10:35 AM	No	1	1					
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Friday Harbour	1885	C13	8:36	On Time	3.00	Beechcraft	11,500	Y	Spirit	NK	487	Roche Harbour	7:00 AM	A	Victoria	7:45 AM	Yes	3	1					
Orcas Island	8																							

# Data Mappings



After getting oriented with the data, our first instinct was to get a better idea of what the islands looked like. Consulting maps of the actual San Juan Islands, we outlined the islands and drew the possible routes.

Drawing out the data allowed us to better process the information and think about what types of displays would help users better reason about this information as well.

In this initial mapping, we color coded the modes of transit (planes, trains, and ferries) to distinguish where different modes went.

# Persona Mappings

From here, we were provided with key stakeholders in the design of the Atlantis Hub. Their specific backgrounds and needs allowed us to narrow our focus and address specific scenarios through our design.



**Elizabeth**, Transportation Director of the San Juan Islands

Her goal is to help visitors to the islands get to where they need to go quickly and efficiently. She has also developed a new PTF pass plan which makes it easy for travelers to combine plane, train, and ferry itineraries, something she wants to heavily market to visitors.



**George**, property owner and retired resident of the San Juan Islands

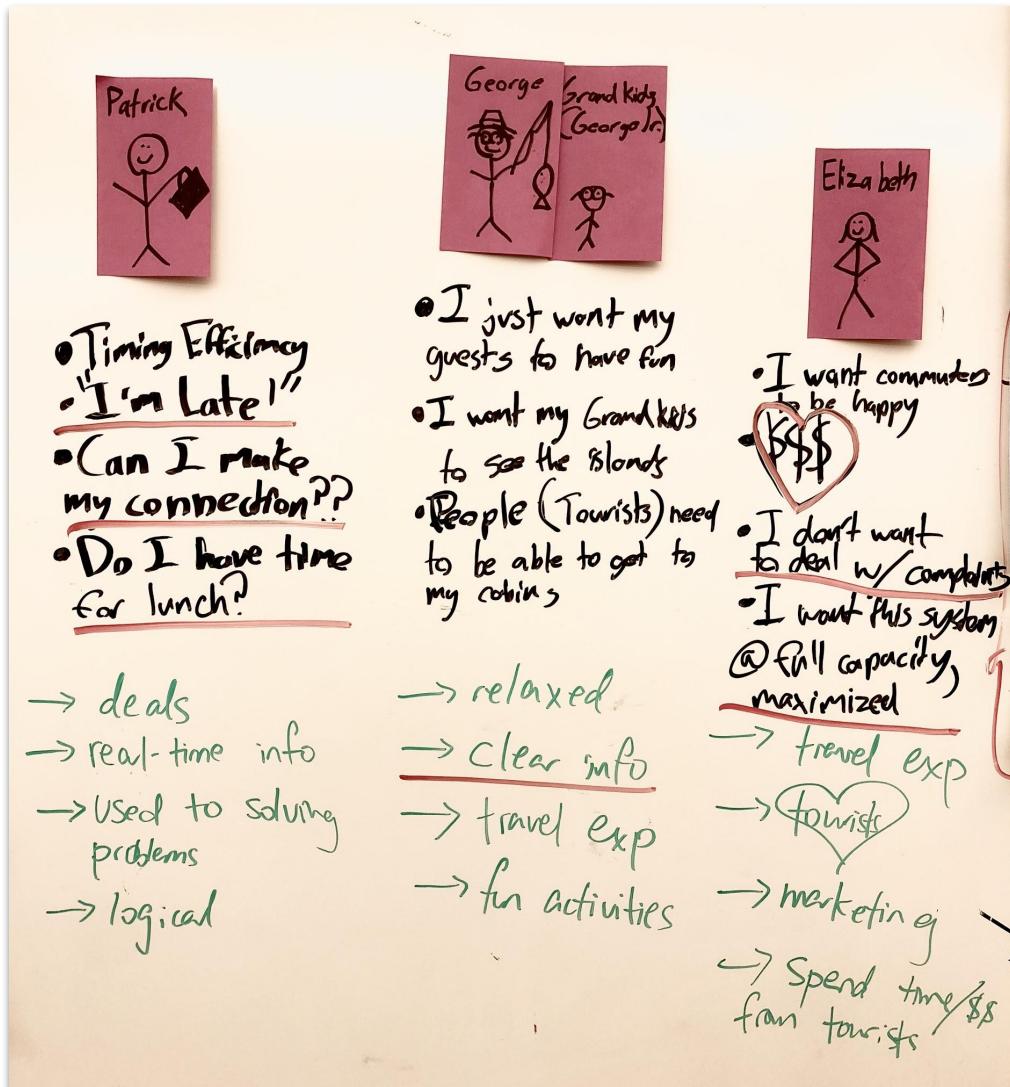
His main priority is easy travel between islands for him and his visiting family or possible AirBnB guests.



**Patrick**, environmental engineer who travels frequently to the San Juan Islands for work

His main priority is easy and efficient travel that gets him to where he needs to be in a timely manner.

# Persona Mappings

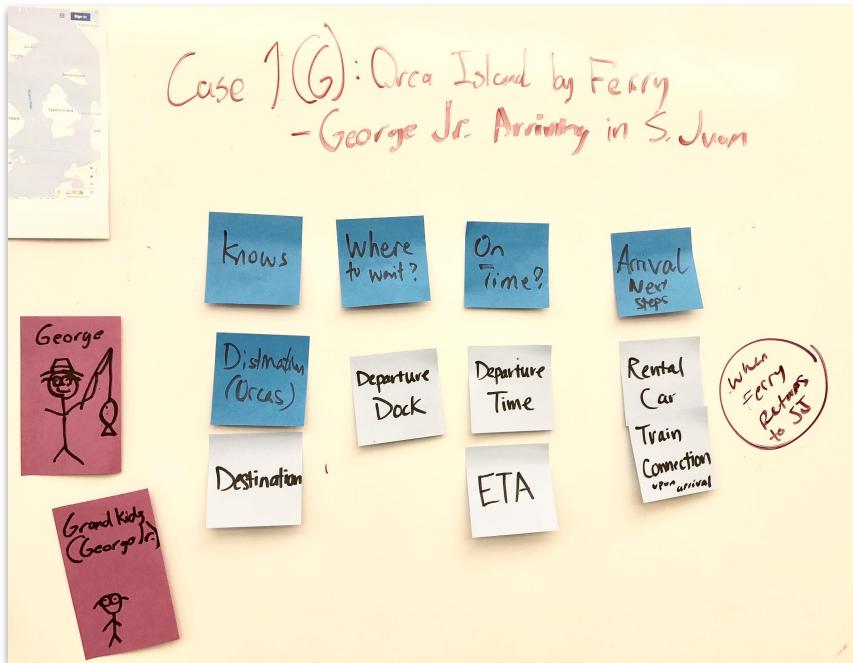


We broke down our stakeholders into specific personas, thinking about the types of things they would say and do when interacting with the transit system.

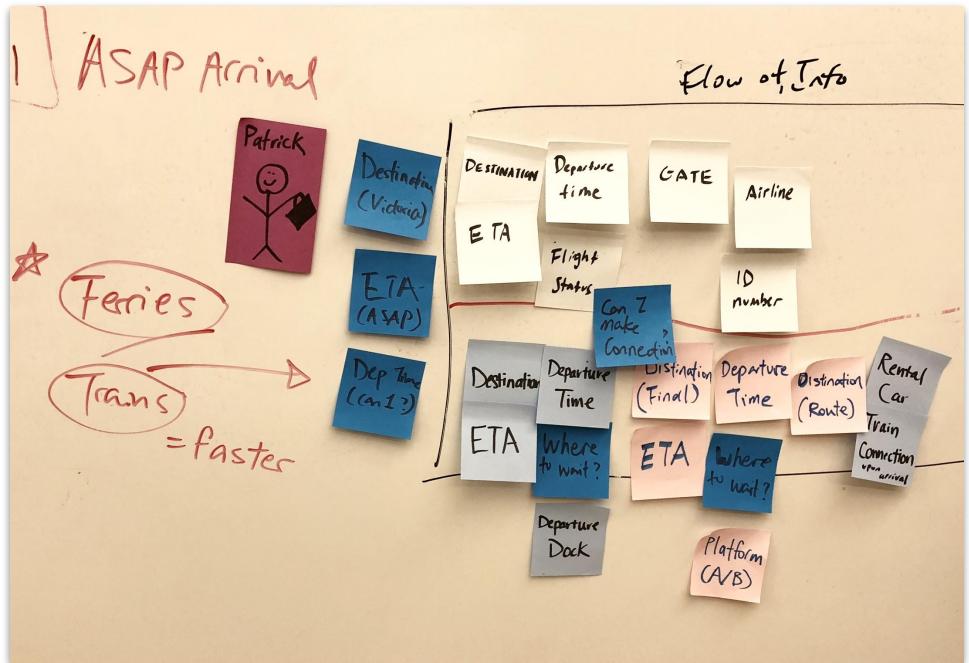
We were sure to consider personas outside of the main three stakeholders we were provided. While George is a primary stakeholder, his opinions are shaped by the way his grandchildren can interact with this ecosystem. Therefore, we attempted to prioritize easy-to-use designs that were family-friendly.

Putting ourselves in the shoes of these stakeholders opened our eyes to problems we wouldn't have considered ourselves, such as tourism or trying to maximize flight miles. This exercise was an important reminder that "**we are not the user**," and that we needed to balance the needs of several types of unique users when designing a digital display.

# Persona Mappings



Case 1: George and his family traveling leisurely



Case 2: Patrick is late for a meeting and needs to be at Lopez ASAP

After mapping out persona needs, we came up with some use cases to help identify what information from the spreadsheet was most relevant for each instance (e.g. arrival time or destination)

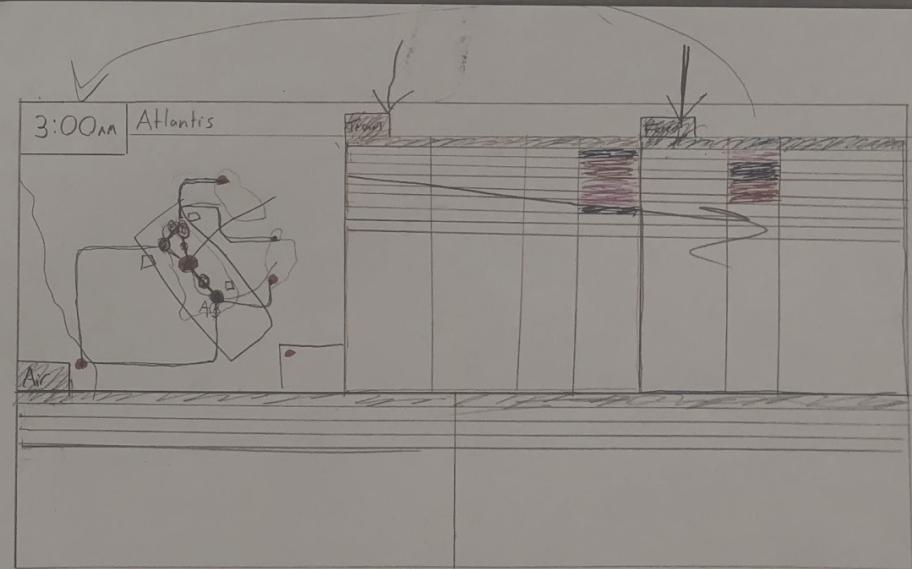
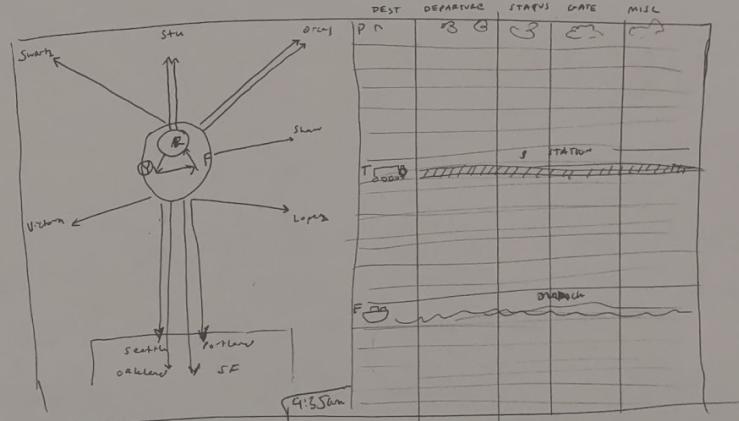
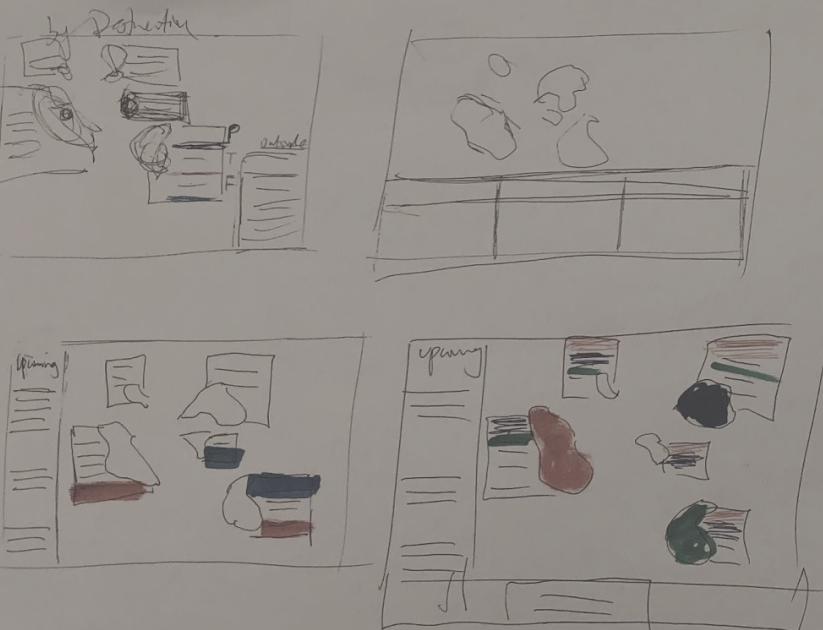
This exercise helped us parse through the massive spreadsheet by applying specific pieces of data to different parts of a use case. When we started to design an actual display, these examples guided us to highlight certain variables above others. So many types of information could easily become cluttered and overwhelming to the reader.

Current Station

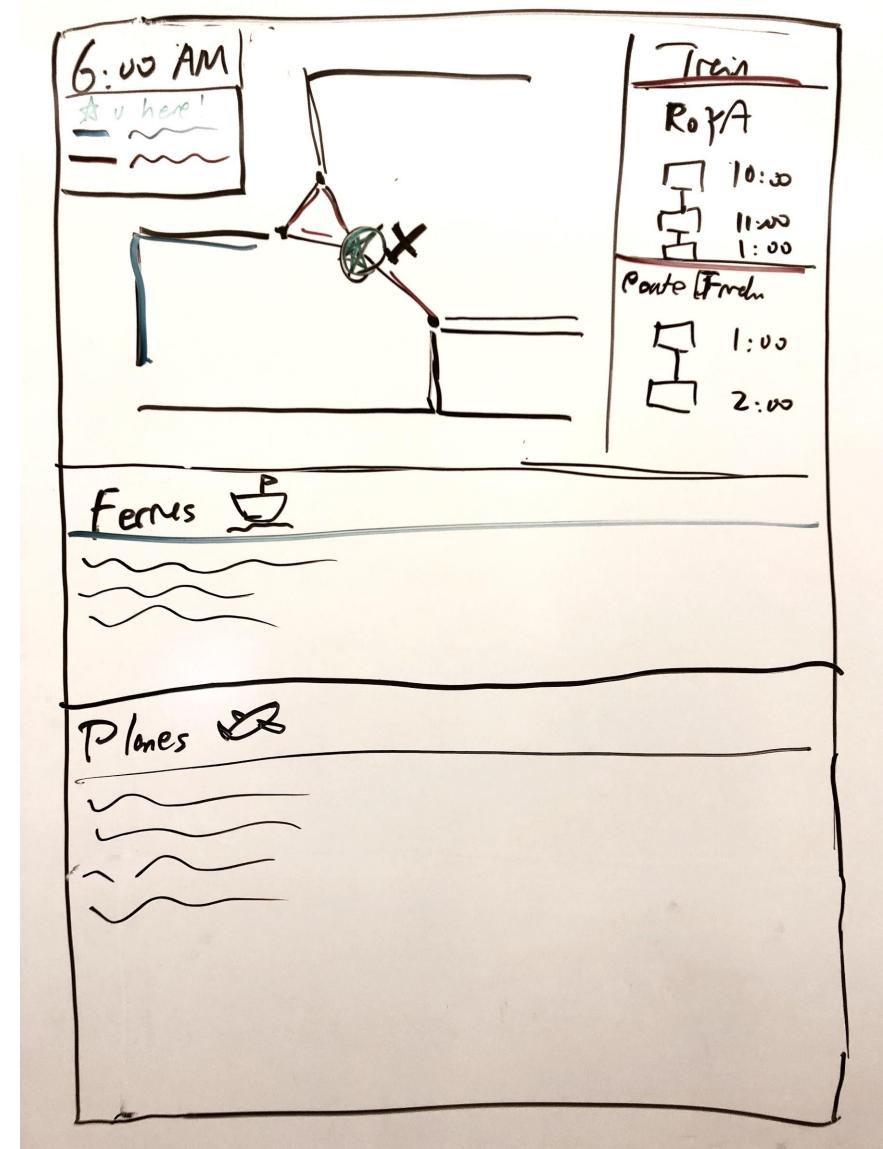
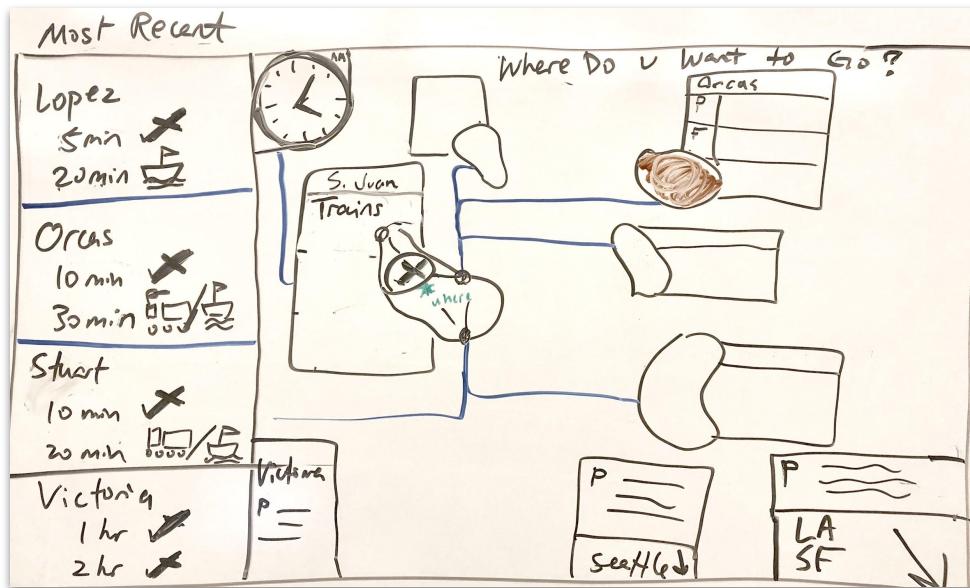
10:00 AM

# Hand Sketches

After thinking through these use cases, we sketched out some first passes at displays that could address our personas needs.

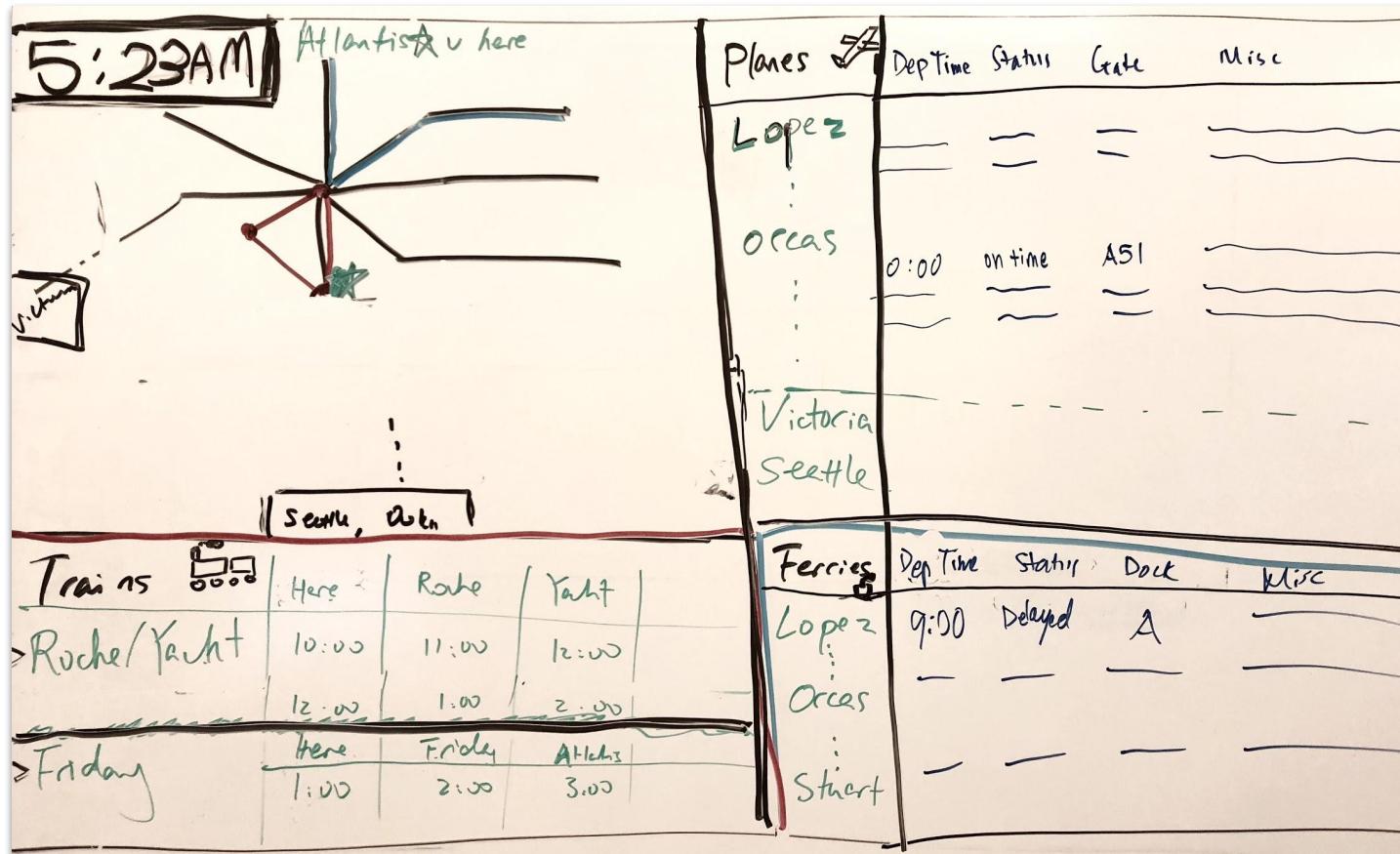


# Hand Sketches



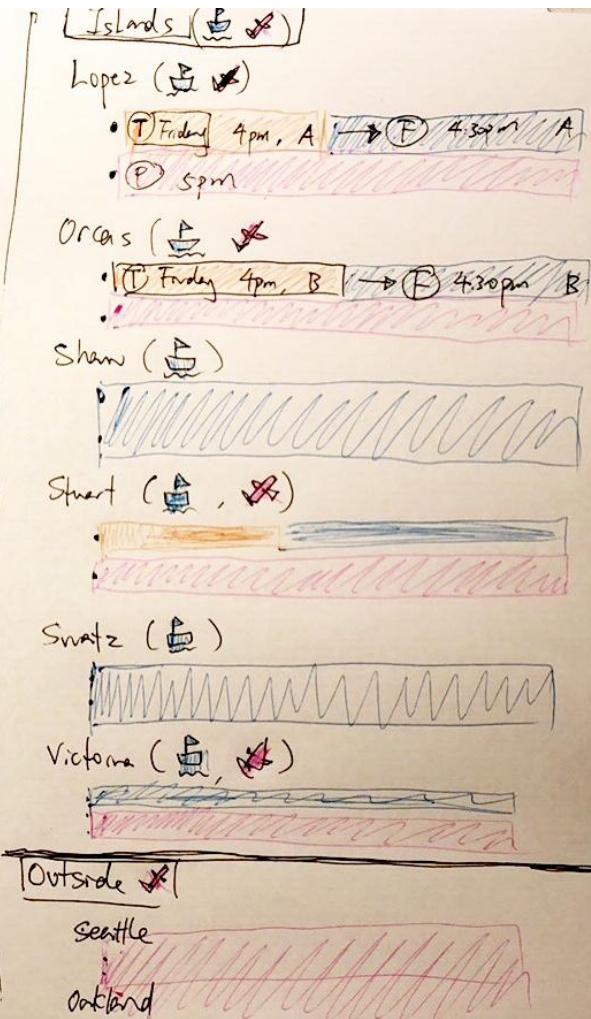
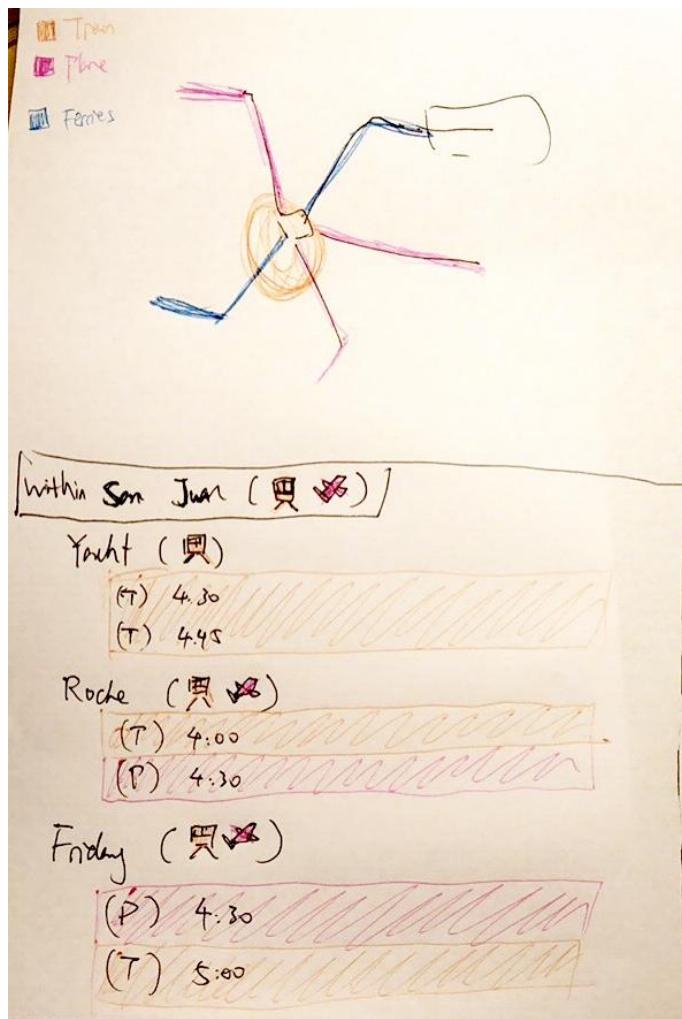
Our team considered several layouts, but the most popular style tended to follow the same formula: map in one corner, with transit information on the other side. At first our designs relied heavily on mode of transit, but later on they moved to a destination-based approach.

# Hand Sketches



Ultimately, we decided on a corner map + transit log approach. We experimented with two versions of this design, one with landscape and the other with portrait orientation. The horizontal landscape layout proved to be less of a strain on users' eyes and easier for a quick lateral scan for map and corresponding log information.

# Hand Sketches



After seeing our design, Skip (spontaneously recruited for a quick user test) noticed that we had neglected an important component of the display: our persona mappings didn't really mention anything about the PTF pass, a key need for some of our users.

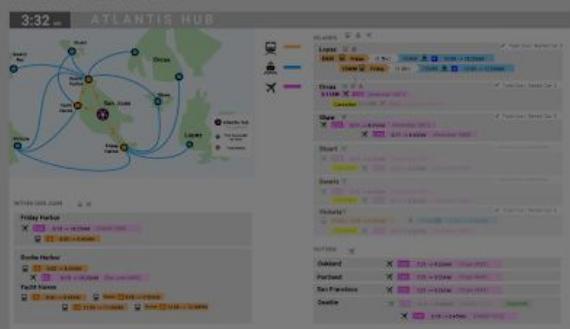
The class liked our idea of scaling back the map information to a more minimal metro map level, but warned us against going too far and stripping away the personality of the islands.

The class also responded more positively to our departure-time oriented display than the mode-oriented version, helping confirm our move in this direction.

# Digital Prototyping

After exploring our initial ideas with whiteboard and paper sketches, the next step was build a higher fidelity digital display

Main canvas



San\_Juan\_I...



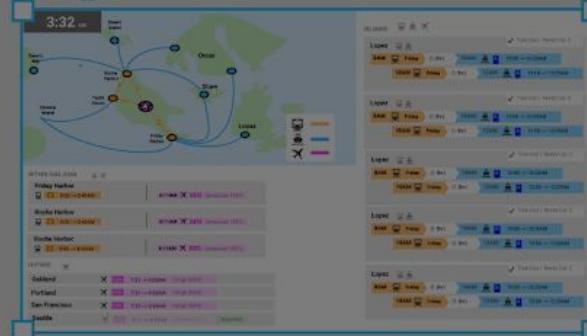
Just map canvas



EXP\_3



EXP\_2

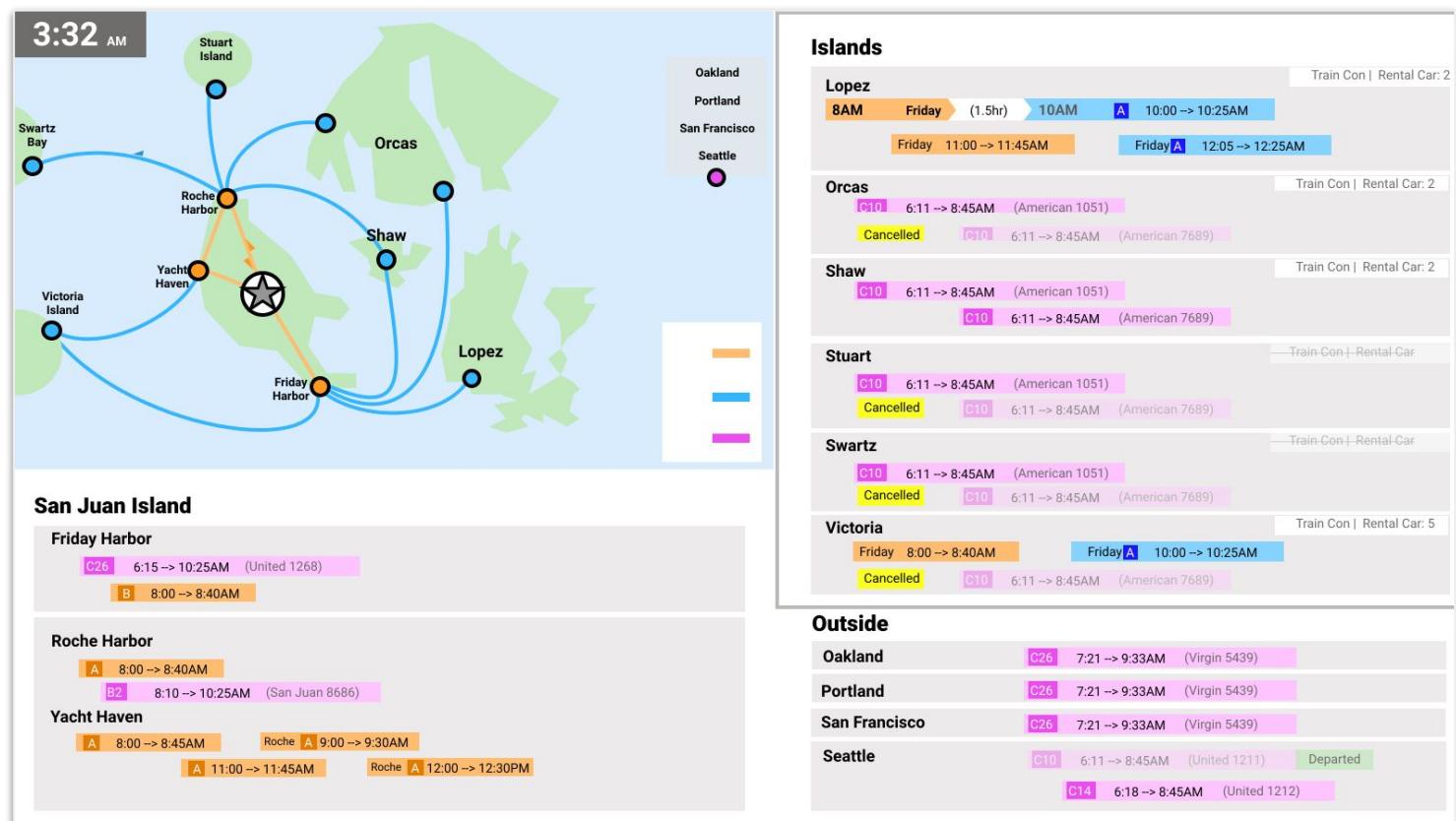


1600×900

# Digital Form

We committed to using departure time (as opposed to destination or mode of transportation) as the primary means of organizing information. Within this framework, trip information was clustered into 'cards' for each destination within a list.

We used colors were to clearly map to modes of transportation between different parts of the display, and we made the map of the San Juan Islands simple and geometric to focus in on the possible routes.



# Digital Form

We received a lot of feedback on our first digital design.

- Although we didn't realize that it was a good design choice at the time, Karen liked how we had grayed out routes that were cancelled. She noted that we could have used this technique to indicate less important but upcoming information.
- We learned that we did not need to display flights destined for cities outside of the island system. This revelation freed up a lot of real estate in our display, and allowed us to focus on the local data network.
- A big component still missing was the PTF pass. Karen reminded us that omission of PTF pass marketing neglected Elizabeth's needs. We needed to figure out pass logistics and dedicate display space for our next iteration.
- There were also some smaller things that needed some touch ups, such as how the map didn't have enough contrast between the islands and the water. These changes would be attended to in future iterations,

# Updated Design Component

**8:30 AM**

**ATLANTIS HUB**

**ISLANDS**

Location	Flight Details	Train Details
Lopez	8AM Train (1.5hr) 10AM Train (1.5hr)	10AM Train A 10:00 -> 10:25AM 12AM Train A 12:00 -> 12:25AM
Orcas	6:11AM Flight C10 (American 1051) Cancelled 6:11AM Flight C10 (American 1051)	✓ Train Con   Rental Car: 2
Shaw	Flight C10 6:11 -> 8:45AM (American 1051) Flight C10 6:11 -> 8:45AM (American 7689)	✓ Train Con   Rental Car: 2
Stuart	Flight C10 6:11 -> 8:45AM (American 1051) Cancelled Flight C10 6:11 -> 8:45AM (American 7689)	✓ Train Con   Rental Car
Swartz	Flight C10 6:11 -> 8:45AM (American 1051) Cancelled Flight C10 6:11 -> 8:45AM (American 7689)	✓ Train Con   Rental Car
Victoria	Flight Friday 8:00 -> 8:40AM Cancelled Flight C10 6:11 -> 8:45AM (American 7689)	✓ Train Con   Rental Car: 5

**Pricing**

- 1 Day Pass - \$19
- 2 Day Pass - \$29
- Week Pass - \$49
- Month Pass - \$99

**Get your PTF Pass today!**

**You are here!**

**WITHIN SAN JUAN**

**Friday Harbor**

Flight C26 6:15 -> 10:25AM (United 1268)
Train B 8:00 -> 8:40AM

**Roche Harbor**

Train A 8:00 -> 8:40AM
Flight B2 8:10 -> 10:25AM (San Juan 8686)

**Yacht Haven**

Train A 8:00 -> 8:45AM
Train A 11:00 -> 11:45AM
Train Roche A 9:00 -> 9:30AM
Train Roche A 12:00 -> 12:30PM

**ISLANDS**

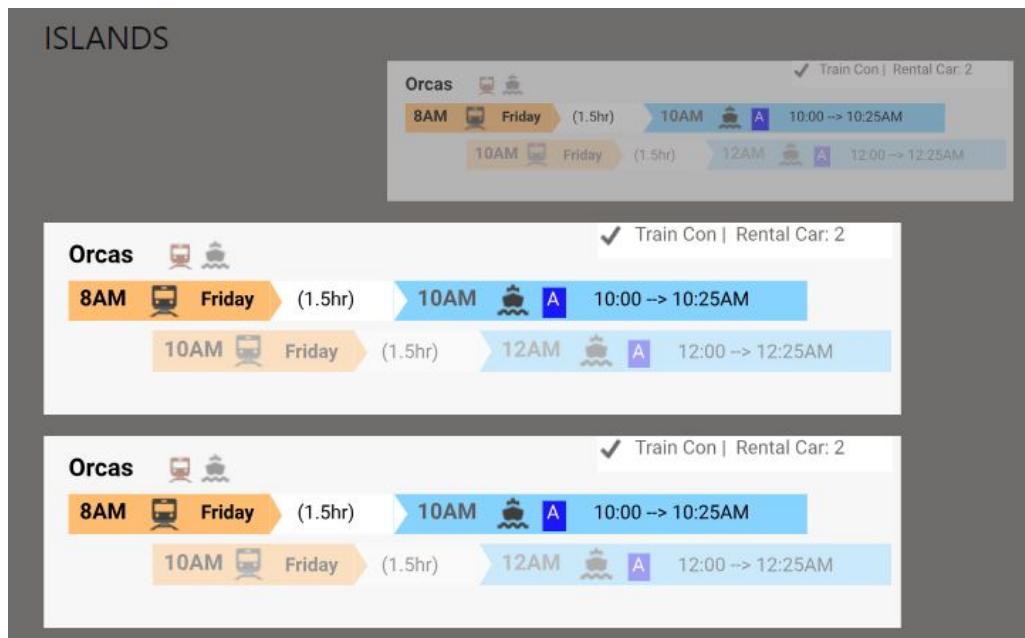
Location	Flight Details	Train Details
Lopez	8AM Train (1.5hr) 10AM Train (1.5hr)	10AM Train A 10:00 -> 10:25AM 12AM Train A 12:00 -> 12:25AM
Orcas	6:11AM Flight C10 (American 1051) Cancelled 6:11AM Flight C10 (American 1051)	✓ Train Con   Rental Car: 2
Shaw	Flight C10 6:11 -> 8:45AM (American 1051) Flight C10 6:11 -> 8:45AM (American 7689)	✓ Train Con   Rental Car: 2
Stuart	Flight C10 6:11 -> 8:45AM (American 1051) Cancelled Flight C10 6:11 -> 8:45AM (American 7689)	✓ Train Con   Rental Car
Swartz	Flight C10 6:11 -> 8:45AM (American 1051) Cancelled Flight C10 6:11 -> 8:45AM (American 7689)	✓ Train Con   Rental Car
Victoria	Flight Friday 8:00 -> 8:40AM Cancelled Flight C10 6:11 -> 8:45AM (American 7689)	✓ Train Con   Rental Car: 5

Incorporating our recent feedback, we built a second version of the display. PTF pass logistics and fading out trips that were further in the future were among our main concerns.

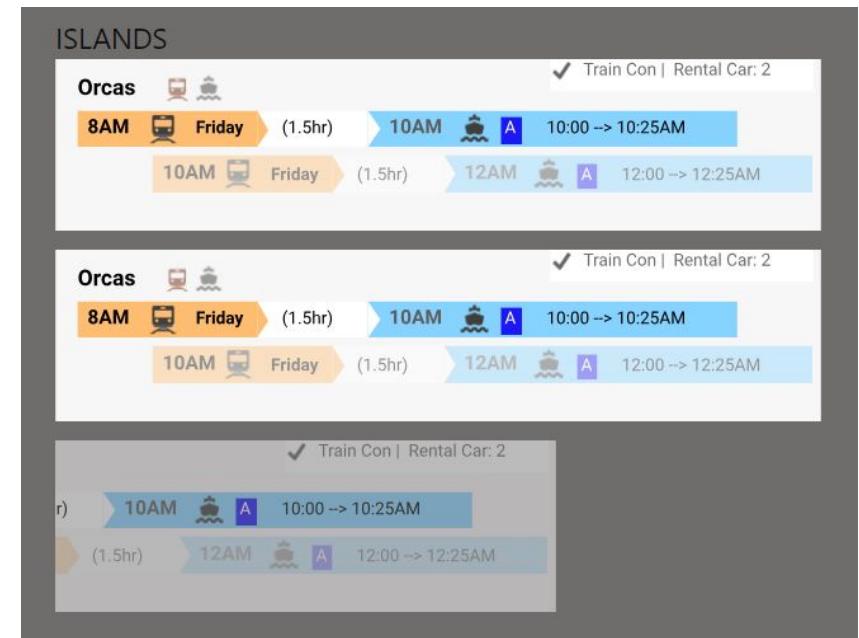
# Adding Motion

After getting some feedback on digital form it was time to add motion.

The most important animation we needed to figure out was how to smoothly update the boarding cards as time passed and flights came in and out. We decided to make the departing card shrink and go off to the right, while new cards would come in from the left. This would highlight what's going out and what's coming in.

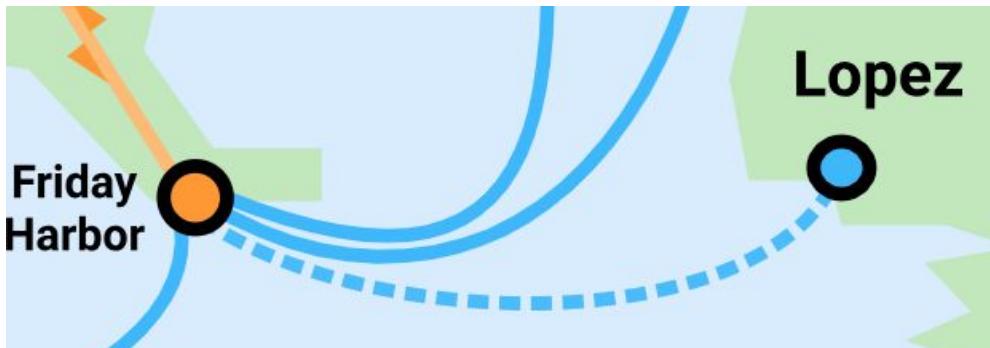


Frame of a card leaving



Frame of a card entering the queue

# Adding Motion



Another animation we considered was having routes on the map and their associated boarding cards light up and “crawl” when they were being boarded.

This animation was intended to couple the map (above) and the table information (below), so that travelers could see what was currently boarding by looking at either the map or the sidebar.



# Motion Feedback

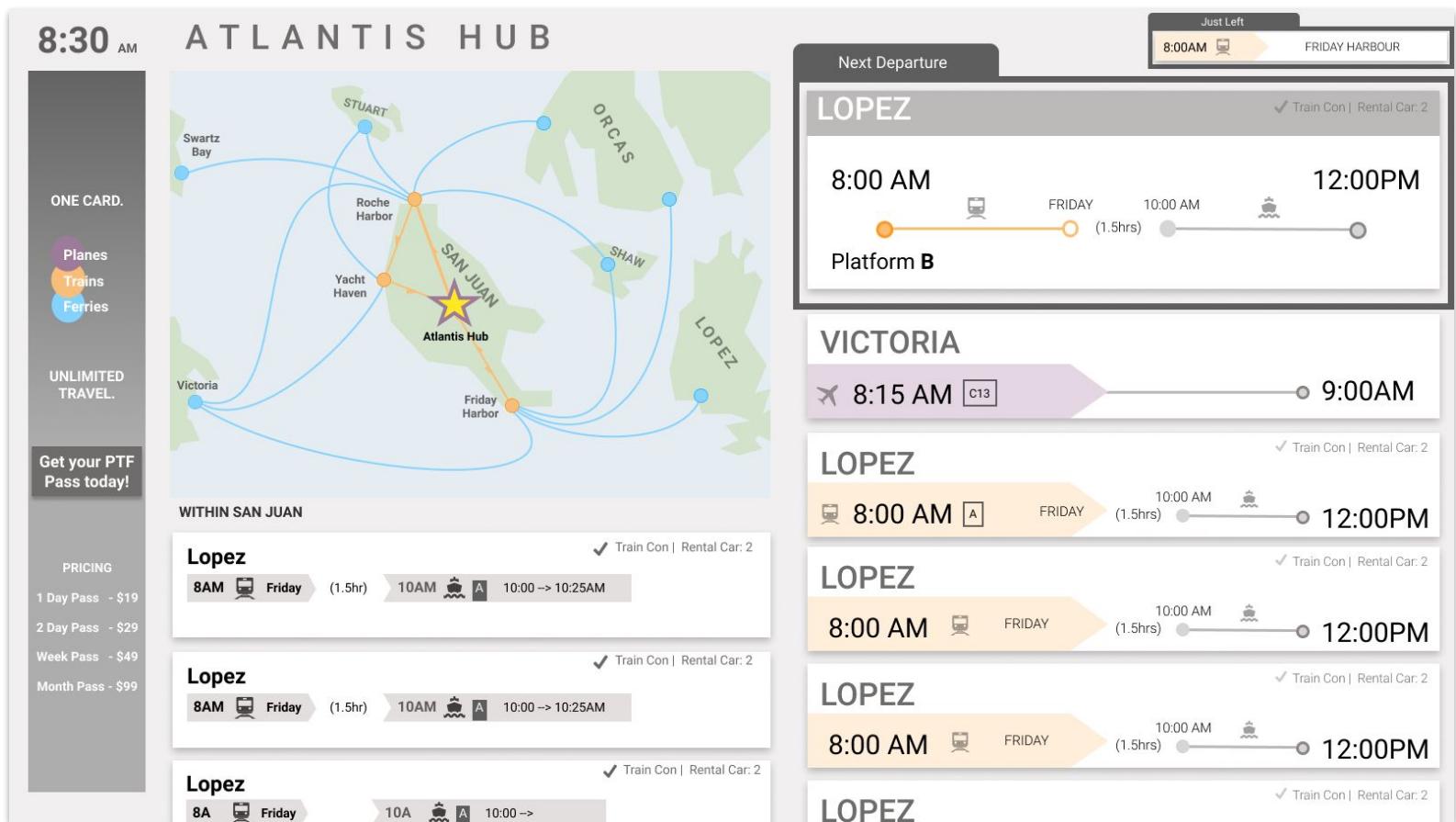
Again, there was a lot of feedback for our second display and first animations:

- First, the crawling route animations were too subtle for viewers to notice a change in state or signal to users that something was happening. Although we were able to easily see this animation from our laptop screens, we did not realize how small and unnoticeable such animations were on the large display.
- Second, the animation with the top being whisked away and a new one appearing at the bottom drew more attention to the bottom route coming in, which would logically be the least important route displayed on the map given it is the furthest away in the future.
- If someone had missed the brief animation of the route leaving, they would have no way of knowing that it had just left. Thus, a classmate suggested having some sort of a recently departed zone displaying the most recent flight to have left. This would indicate to users that they've just missed that flight by a certain amount of minutes and would direct them to look for the next flight.
- With regards to the display overall, a piece of feedback we received was that there were too many colors, as we tried to couple everything that had to do with planes, trains, and ferries to each other. When it comes to color on giant displays, less is more, and we need to attend to that.

# Updated Design Component

Using the feedback, we toned down on the colors, cleaned up the visual style and emphasized the arrival time. Also, we pruned the information, limiting the route information to 1 trip per card.

As for animations, we went for a more minimalistic approach. Cards simply slid upwards, and people who missed the animations could still see what just left with the new dynamic state information such as "Next departure" & "Just Left".

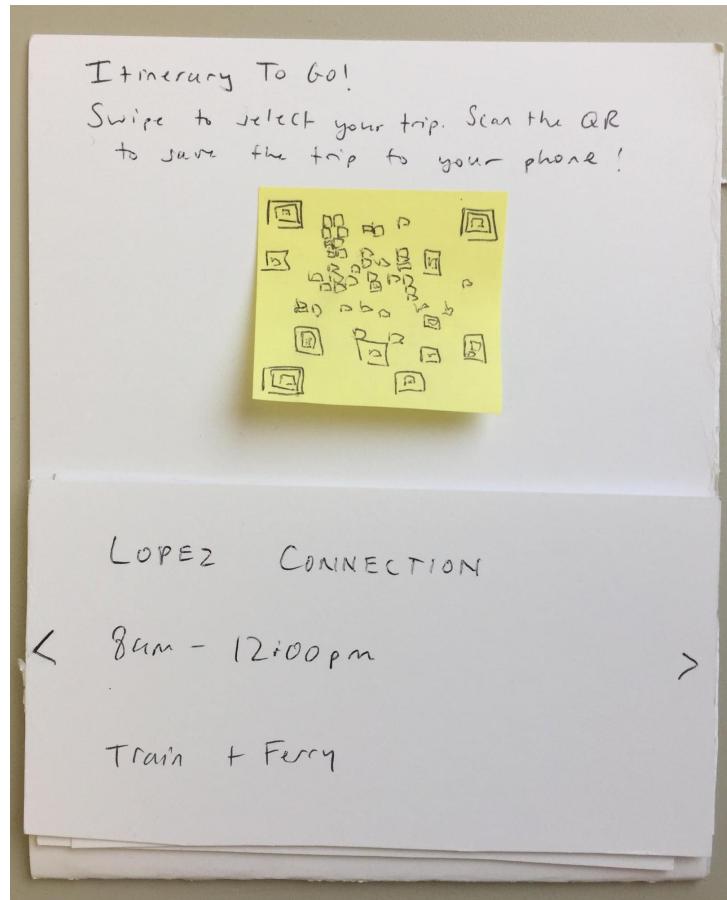


# Adding the Control

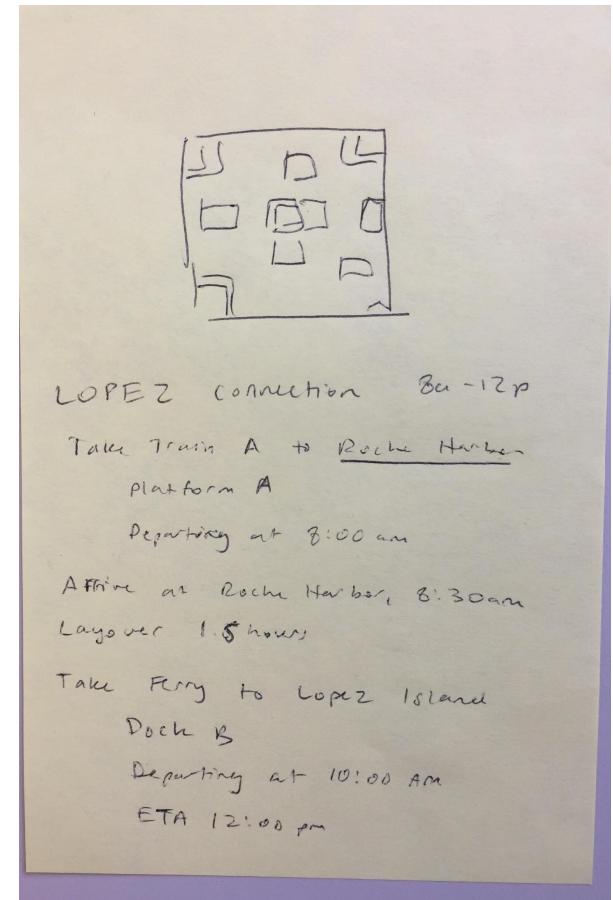
In addition to updating the design display, this iteration required the inclusion of a control.

We decided to implement a tablet-based control system that allows visitors to scan a unique destination QR code, saving a trip itinerary to their mobile device.

When visitors select a route on the tablet, the map on the large display shows the crawling animations to couple the tablet and the display.



*Lo-Fi Tablet with varying destinations*

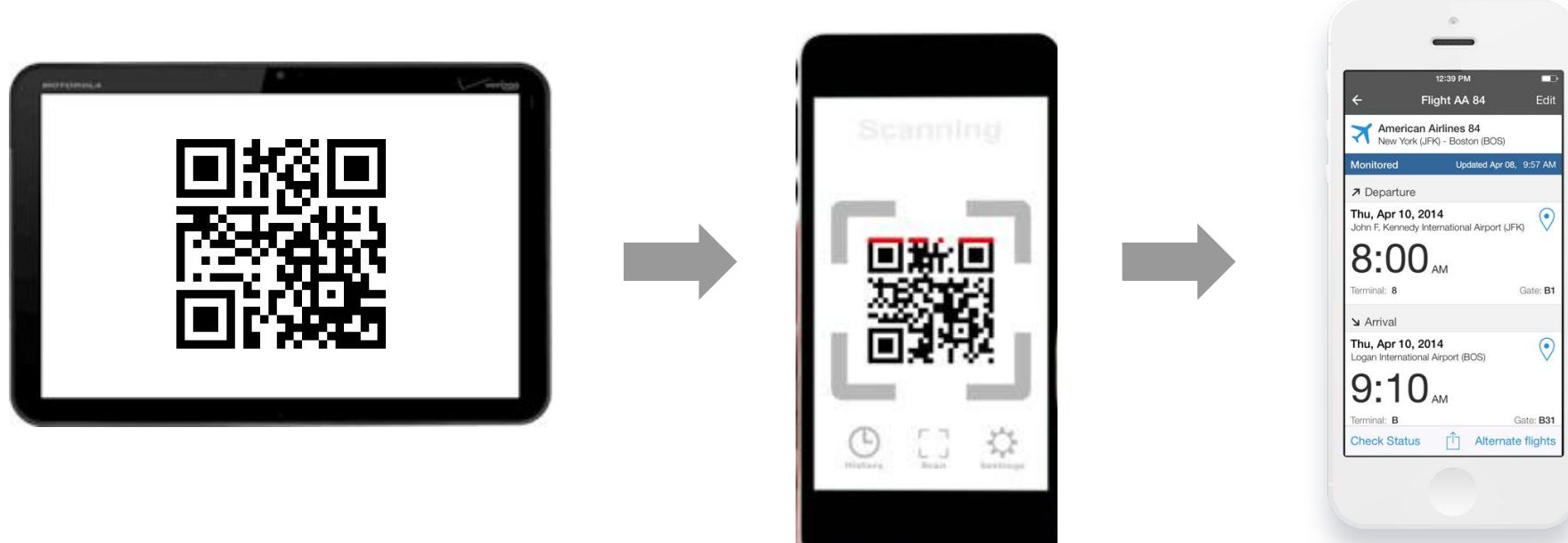


*Itinerary sent to user's smartphone*

# Adding the Control

Here we have a mid-fi mockup of the control using the tablet and smartphone device. Users would select the appropriate destination from the tablet, which autogenerates a unique QR code.

Next, users scan the QR code to their smart device, which uploads a sample itinerary for the user to save and take on the go with them. In this iteration, we've begun to explore a more fleshed out full app version of this itinerary, allowing users to check trip status or alternate flights.

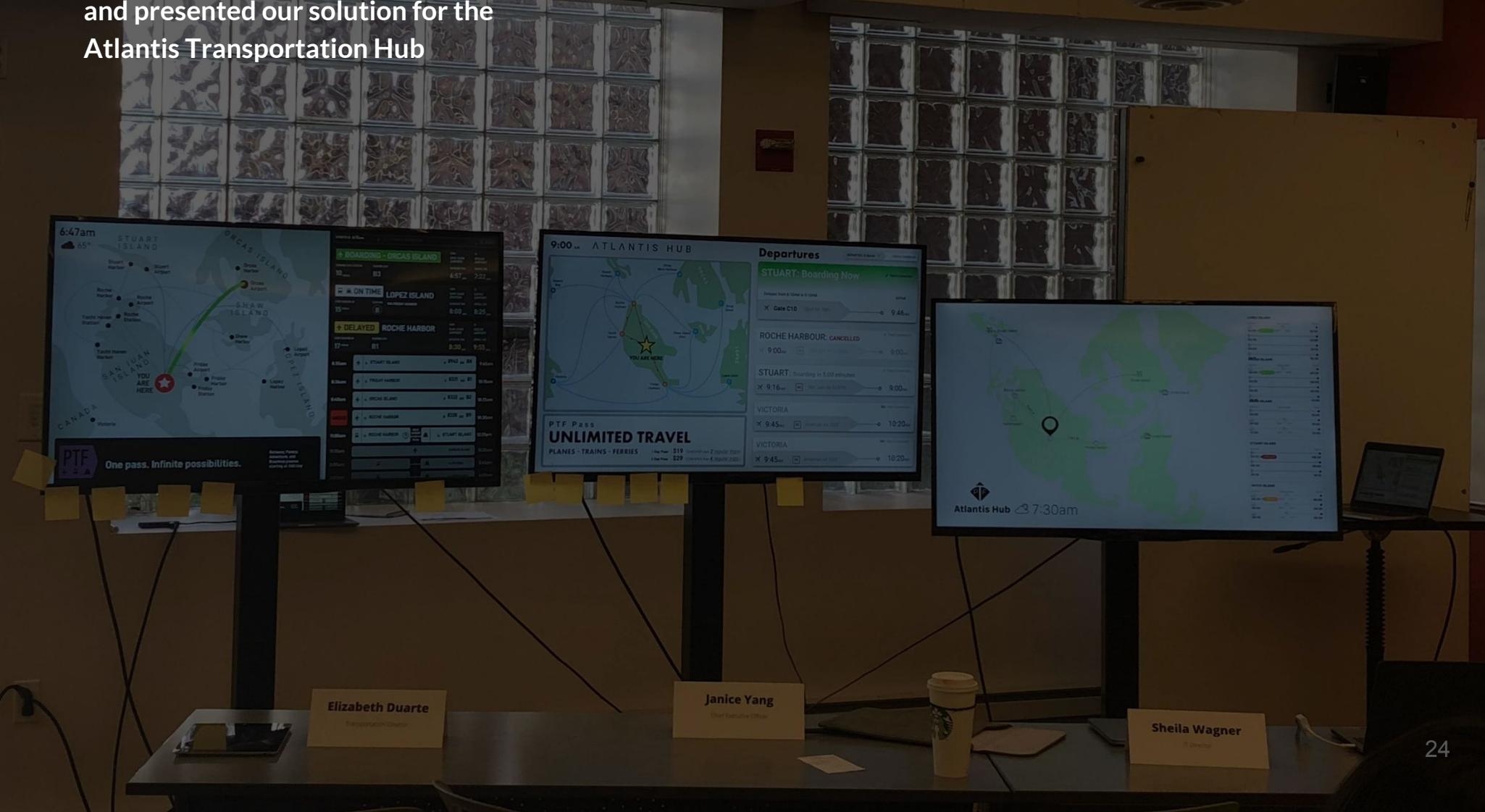


# Feedback

- Our control idea was well-received and additional iterations will explore additional concepts like including more on the PTF pass..
- We received positive feedback on our shift back to a more muted color scheme. After many iterations, we finally bid farewell to the mode-of-transit color coordination and decided to use color in new ways. Karen suggested we take this a couple steps further and use color to demonstrate boarding status as well.
- We ran into some issues with screen real estate regarding what to do with train departure times. In the current iteration the trains were somewhat separate from the ferry and airplane departures. We decided to consolidate all modes of transit and find another way to make the best use of the added space.
- After switching from destination-focused to departure focused, our animation using a live feed of upcoming departure times was better received. Having the entire list move together solved the issue of attention being drawn to the bottom.
- Our inclusion of a “Just Left” area was useful to users who may have just arrived at the display a few minutes late and want to know if they just missed their connection.

# Final Display and Pitch

Factoring in feedback on our display, animation, control, and overall business model, we finalized and presented our solution for the Atlantis Transportation Hub



# Final Display

9:00 AM ATLANTIS HUB



PTF Pass

## UNLIMITED TRAVEL

PLANES • TRAINS • FERRIES

1 Day Pass - \$19 (CHEAPER than 2 regular trips!)

2 Day Pass - \$29 (CHEAPER than 4 regular trips!)

## Departures

DEPARTED: 8:56AM

FRIDAY HARBOUR

### STUART: Boarding Now

Delayed from 8:10AM to 9:10AM

Gate C10 Spirit NK 1881

Arrival

9:46 AM

### ROCHE HARBOUR: CANCELLED

9:00 AM

B3 San Juan Air SJ 8996

9:00 AM

### STUART: Boarding in 5:00 minutes

9:16 AM

B3 San Juan Air SJ 8996

9:00 AM

### VICTORIA

9:45 AM

D2 American AA 1032

NO Train Connection

10:20 AM

### VICTORIA

9:45 AM

D2 American AA 1032

NO Train Connection

10:20 AM

# Final Animation

For the final animation, we decided to keep it simple. Since the response to the sliding up animation was generally positive, that was what we ended up using.

8:56 PM ATLANTIS HUB

Map showing the locations of various ports and islands. The map includes labels for STUART, ORCAS, SHAW, and LOPEZ islands. Key ports shown are Stuart Harbour, Orcas West Harbour, Orcas South, Lopez Dock, Friday Harbour, Yacht Haven, Roche Harbour, Victoria, and Shaw Island Port. A yellow star with the text "YOU ARE HERE" is positioned in the center of SAN JUAN island. Blue lines represent ferry routes connecting the islands.

**PTF Pass**  
**UNLIMITED TRAVEL**  
PLANES • TRAINS • FERRIES

1 Day Pass - \$19 (CHEAPER than 2 regular trips!)  
2 Day Pass - \$29 (CHEAPER than 4 regular trips!)

DEPARTURES

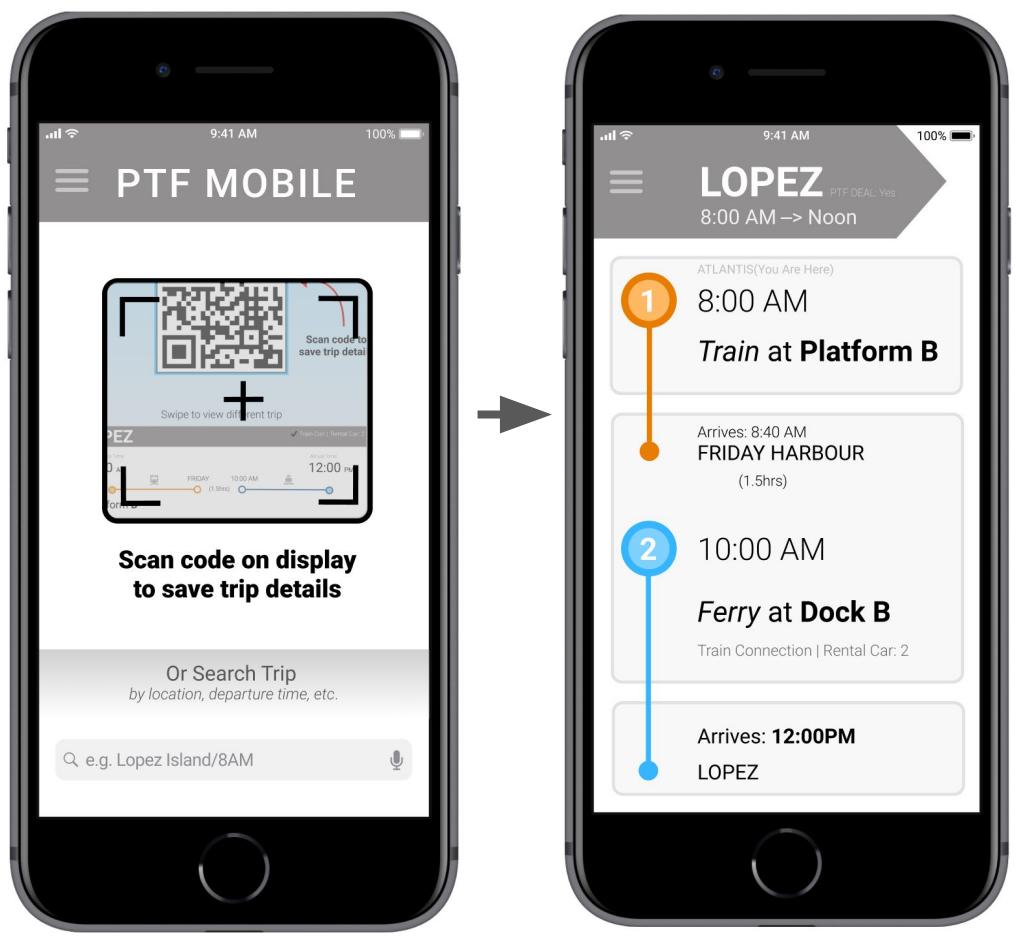
Arrival
Gate B7 San Juan Air 8336 9:25 AM
<b>ROCHE: Cancelled</b>
9:10 AM C10 San Juan Air SJ 1881
STUART ✓ Train Connection
9:10 AM C10 San Juan Air SJ 1881 9:47 AM
STUART ✓ Train Connection
9:16 AM B3 San Juan Air SJ 8996 9:53 AM
VICTORIA NO Train Connection
9:45 AM D2 American AA 1032 10:20 AM

The departures section lists flight information for various destinations. It includes arrival times, departure times, flight numbers, and airline names. Some flights are marked as cancelled (e.g., ROCHE) or have train connection status indicated.

# Final Control

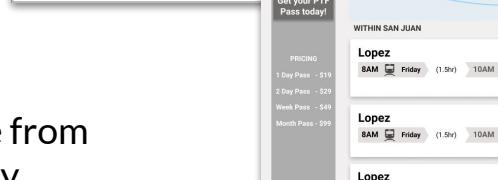
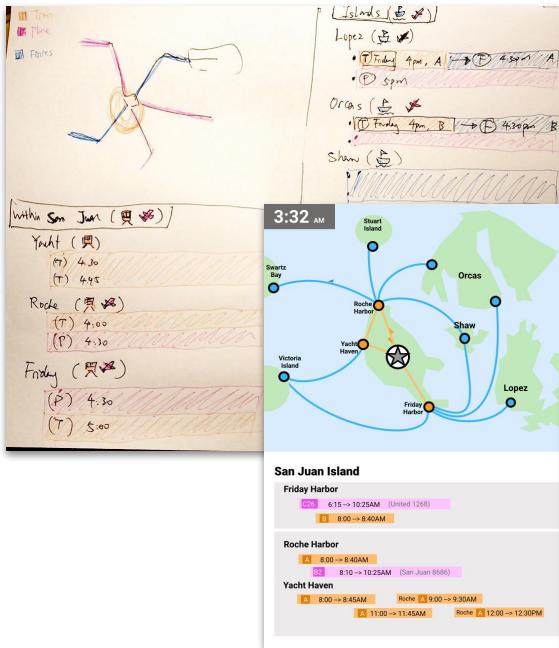


Tablet Display



Smartphone Display

# Evolution



**PTF Pass**  
**UNLIMITED TRAVEL**

PLANES • TRAINS • FERRIES

1 Day Pass - \$19 (CHEAPER than 2 regular trips)

2 Day Pass - \$29 (CHEAPER than 4 regular trips)

Through each successive iteration, several aspects ended up remaining basically constant. The map at the top left and list of departures along the right remained the primary means of conveying information.

The most obviously visible change from beginning to end is the increasingly strategic and minimal use of color within the display. The point of entry and overall hierarchy also move around with each successive attempt.

# Final Pitch

We pitched our final design to Elizabeth and several members of her executive board (or rather, their imagined imposing presence).

We decided to dress as our stakeholders during our pitch to demonstrate how we kept them in mind when designing a system for them.

Stakeholders Patrick (top right) and George (bottom right) also made an in-person appearance to act out their personal concerns.



# Final Pitch



In a class vote for best display design, our design tied with another group's for best visuals.

Voters cited our display being more “friendly” to look at and less overwhelming than other displays.

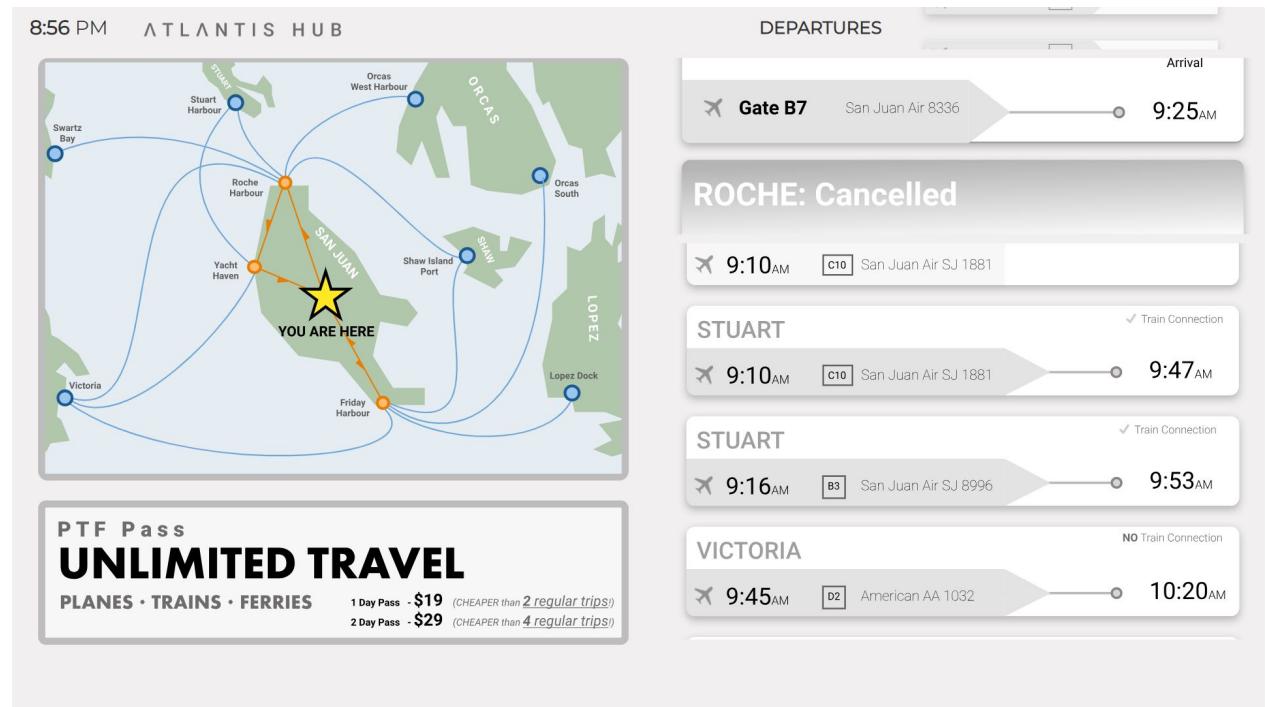
Class members also praised our pitch style and appreciated our creativity in taking on the personalities of our stakeholders. They also found our multi-display management very professional.

# Final Feedback

After presentation of our final design, viewers recommended to make the list of destinations appear more continuous by showing half of the last card on the edge of the screen.

Another comment we received was that our display still lacked a completely coherent hierarchy of data. However, our initial point of entry “could be seen all the way from the Starbucks on Craig Street”.

Our presentation was generally well received, but we as a group believe there are several avenues for improvement moving forward.



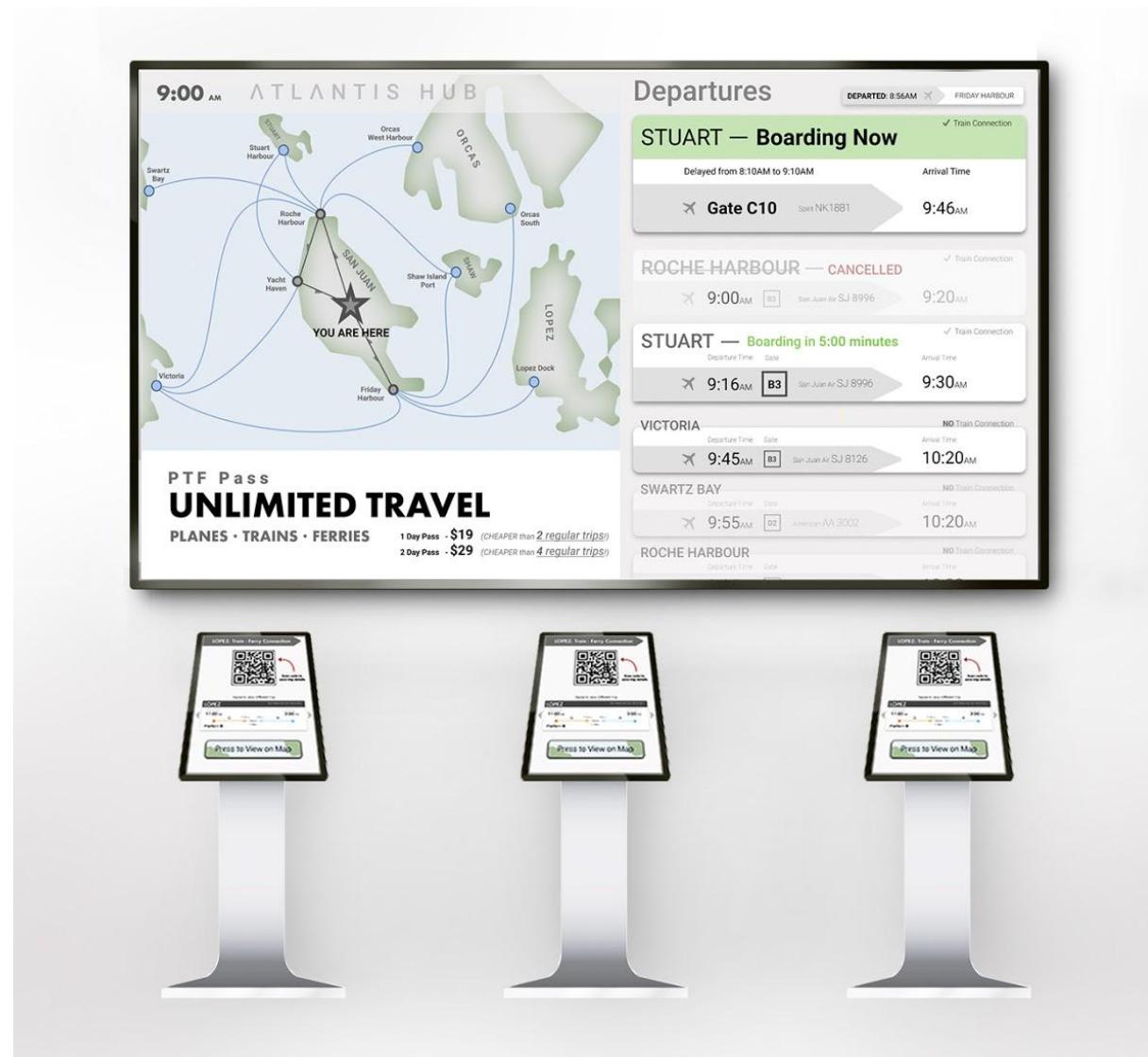
*Unlimited Travel and then what?  
Future iterations will require better progressive disclosure*

# Future Steps

Considering our feedback, we think that our group could benefit from exploring a redesign of the visual display and the control system.

Given more time we would have tried different layout options and had a more precise algorithm for display for different scenarios. This current display's information is somewhat brittle, but with more data and better business logic design we could support a more robust system.

In addition, we feel that our control was a strong basic idea that could be strengthened by more in-depth iterations. We would like to expand the tablet-based control to create several stations for multiple users at once.



Multiple station version of the control