



ECE 1778: Creative Applications for Mobile Devices



Lecture 4
February 3, 2020



(1)

Today

1. Logistics – Plan, Assignments
 - Description of Assignment S3
 - Proposal
2. Block Diagrams + Living in Apps
3. Notes on Group Work
 - Working in Groups
4. External Sensors/Gadgets you may want to use
5. TeamChooser
 - Lessons from an App development experience
6. Informal Topic Discussions/Coordination



Logistics

(3)



Assignments

- S2 was due yesterday
 - Any comments/questions?
- S3 will now posted on course website
- P2 is due next Tuesday
- S1 and P1 are being graded



Assignment S3

Due Tuesday February 9

All assignments are on both Course website and on Quercus



Assignment S3 – for Specialists

- Assignment S3 is tuned to help with Project
- The goal is to stimulate ideas for different features of the App in your project, and to aid discussion within team

- First:
 1. Ask you to reprise your field description from S1.
 2. Give best current version of your **project** description at the same level as the Approval-in-Principle

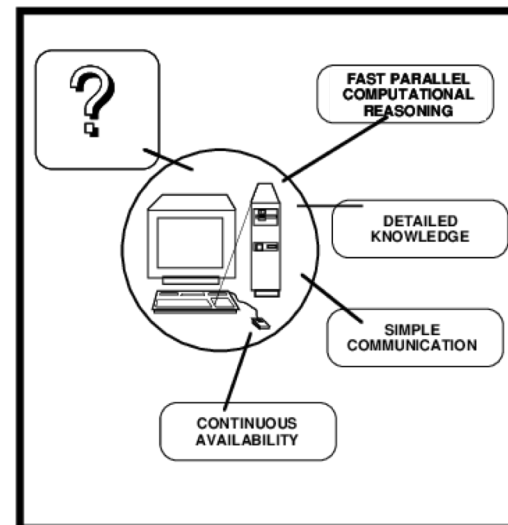


Part 3 – Consider what is possible

- Consider the goals/needs of the people using the app together with what technology can do
 - Suggest ‘walking through an example’ use – pretend
 - Gave this feedback to almost all groups
 - Think about phone/internet/computers
 - Draw from your own knowledge of what you’ve seen apps/computers can do

CAPABILITIES OF COMPUTERS

➤ Can store and work with large amounts of information.



Part 3 – Describe/Invent Features!

- Conceive & Describe separable **Features** that you want in your app
 - **without** worrying about the resource, time or complexity
 - (want to free your mind from the constraints to begin)
- But what is a feature?
 - And what does separable mean?



What is a Feature?

- It is a separate piece of functionality in software
 - it might be essential to the basic operation
 - It might be a ‘nice-to-have’ but not essential part.
- Example:
 - Essential: in app that gives list of ski-related products, the **list** itself is essential
 - Having the ability to sort the list based on price is a feature
 - Or sort on other aspects of the product
- How to do this? “Live In” your app
 - Concrete examples in a moment



Parts 3 and 4

3. Rank features in order of importance and describe why they are high or low
 - **Crucial**, was done poorly last year!
 4. Determine with programming partners what order to build
 - Based on your joint understanding of what is necessary and how difficult features are
 - This list can be bigger than what you do in the actual project.
- Purpose – to direct your creativity, and to start the process of figuring out what is practical



Good Examples

Here are two good examples of this assignment:

1. <https://www.dropbox.com/s/gh2qaxkyggqazhr5/example1.pdf?dl=0>
2. <https://www.dropbox.com/s/eqa5vaw5wr4zgyg/example2.pdf?dl=0>

■ Feature ranking wasn't done as well as it should be



Project



Project Stages

- 1. Forming Groups**
 - done
- 2. Project Topic Approval-in-Principle**
 - Wrapping up
- 3. Project Proposal/Plan**
 - Document Due February 15th
- 4. Proposal & Plan Presentations**
 - February 17th - see lecture 3 for details
 - **NOTE EXTRA LECTURE Wed February 17th, 6-8pm**
- 5. Spiral 2 & Spiral 4 Presentations**
 - 2: March 10/17 4: March 24/31
- 6. Final Presentations**
 - Weeks of April 7/14
- 7. Final Report Due April 21st**



Approval-in-Principle in Good Shape!

Approval in Principle	OS	Project Name	Specialist
Yes	iOS	Tootti	Ricci I
Yes	Android	Track-a-mole	Neall S
Yes	Android	Interview log	Hsiang-I
Yes	Android	Protosight	Bonnie
Yes	iOS	CalmMind	Annie
Yes	Android	Ready	Ingrid
Yes	iOS	iPhasia	Stéphani
Yes	Android	Re:Food	Zachary
Yes	iOS	Chordable	Bahar C
Yes	Android	IllumiSmart	Changcl
Yes	iOS	Present Better	Casey G
Yes	Android	Dynasway: Concussion	Calaina
Yes	iOS	NWTO	Don Ca
Yes	Android	U Health	Jaime O.
Yes	Android	Paxifist	Gissel
Yes	iOS	Flexinome	Aaron
Yes	Android	ParkinSense	Carolina G
Yes	Android	Lightbulb	Neil D
No	Android		Andrei
Yes	iOS	NONAME	Mélina C Brad



Proposal/Plan Due Monday Feb 15 @ 6pm

1. Describe Goal, make more precise
 - What & Why
2. Rough design of what the **user** of the App sees
 - Screen designs
 - Can use Marvel App - <https://marvelapp.com>
 - From Specialist Assignment 2
 - Any drawing package will do
3. **Block Diagram** overview of planned code
 - The large pieces (roughly 5) of the system
 - With short description of each (below picture)
 - Should be linked to the screens
 - I will discuss creation of block diagrams shortly



Plan, continued

4. Statement of Risks/Issues

- What roadblocks/issues/challenges do you foresee?
- Software, Hardware, Ethics, Data ...

5. What do you need to learn that you don't know

- all members

6. **Important:** Specialists

- Submit a 500 word essay on
 1. How App relates to field of Specialist, and
 2. How the Specialist will contribute to project
 - Need to be an active participant; want clear thought here
 - **Issue Tracking** on Github?

■ **Document must have these sections; will lose marks if missing**



Proposal/Plan Document

- length: 1500 words max
 - not including Specialist essay (#6)
 - include word count as part of document, penalty for overage
- Seeking clarity, not quantity of words
 - Omit needless words
- **One member of group should submit for group**
 - Under “Proposal Plan” for your group, under its name
- Worth 10% of grade
 - including in-class presentation done following week
- Document Due Monday February 15th at 6pm



A Note on Block Diagrams

And the creative process



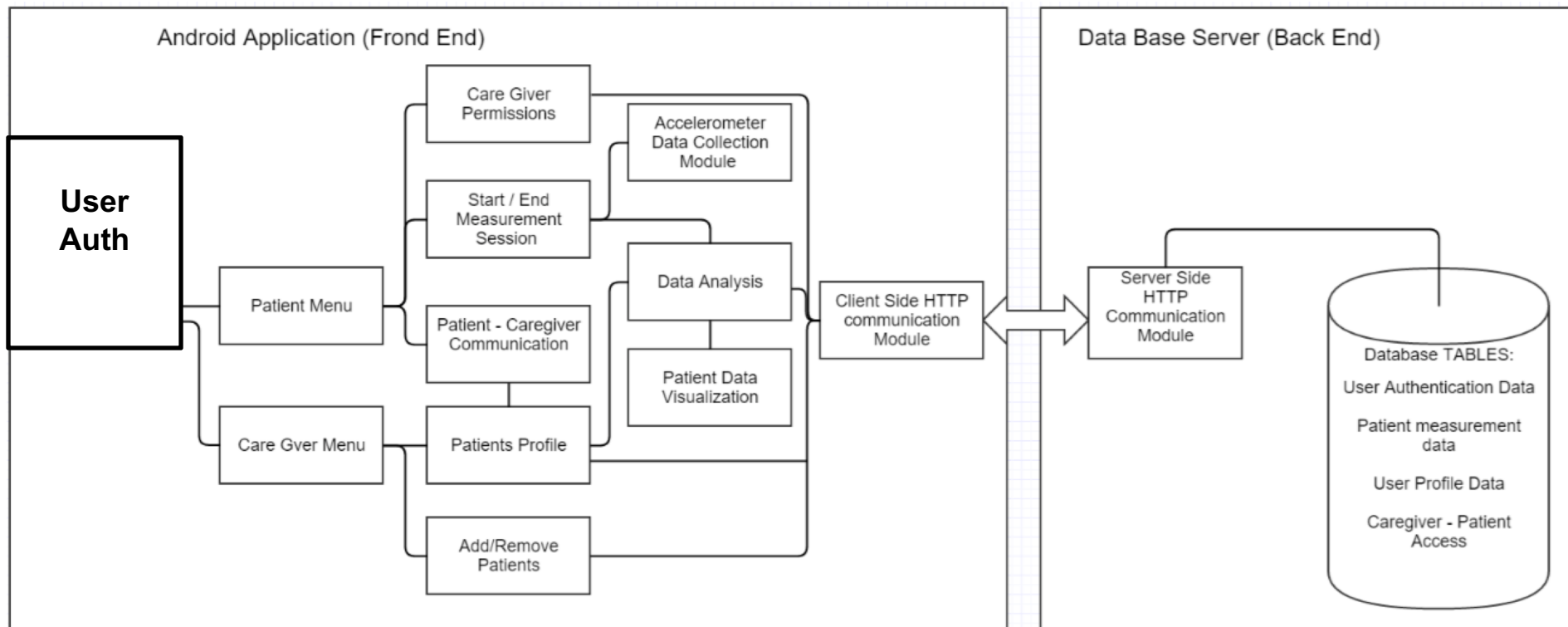
Block Diagrams

- In Proposal you're asked to give a block diagram of your planned software
 - In past, many have not understood this
- A Block diagram describes the major pieces of the project's functions (roughly 5)
- Is the first step in the standard **divide & conquer** approach
- Draw blocks, give each block a name
 - Name gives a sense of what it does
 - Provide several sentences that give more detail of function of each block

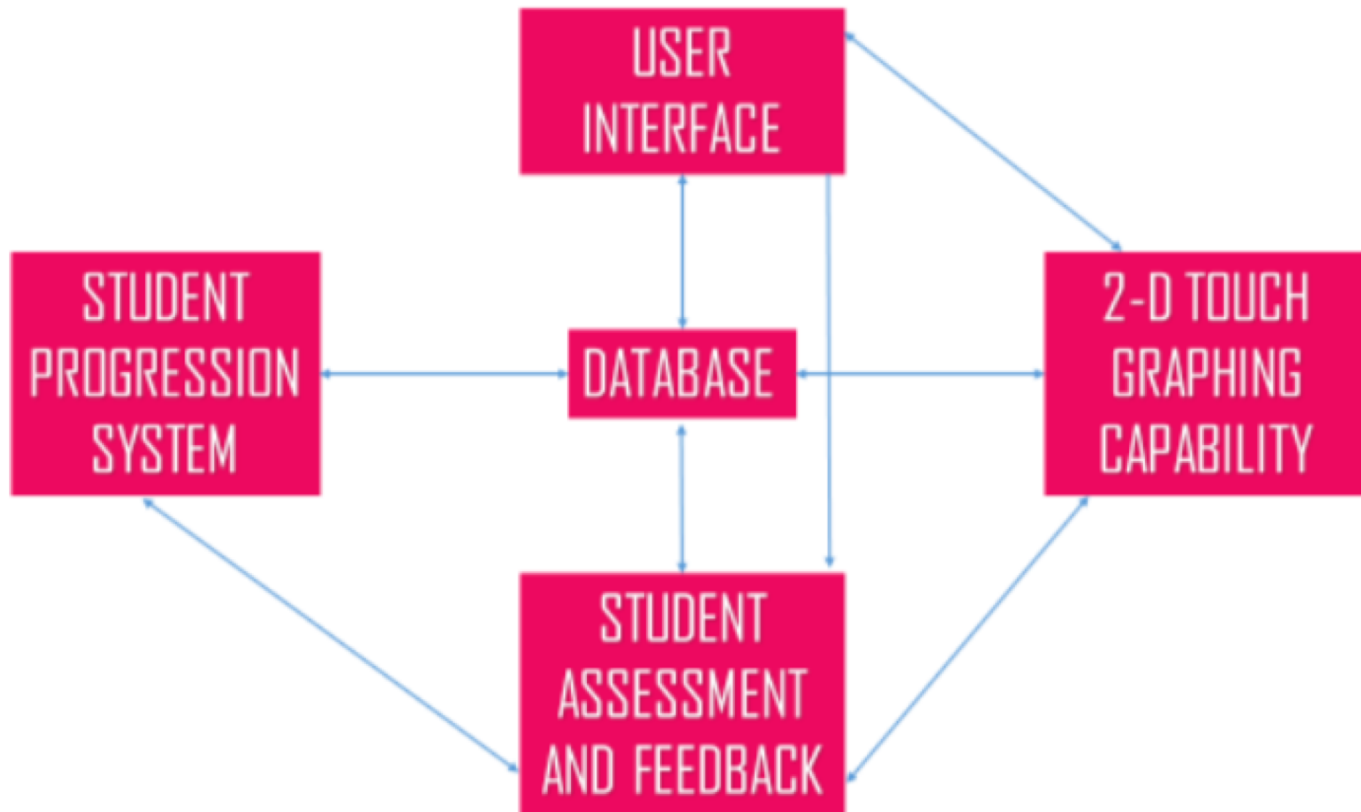


Block Diagrams

- Lines between blocks show communication
- May need to break blocks themselves down
 - In a hierarchy, in a subsequent part of your plan document
 - This example has **too many** blocks, too small font

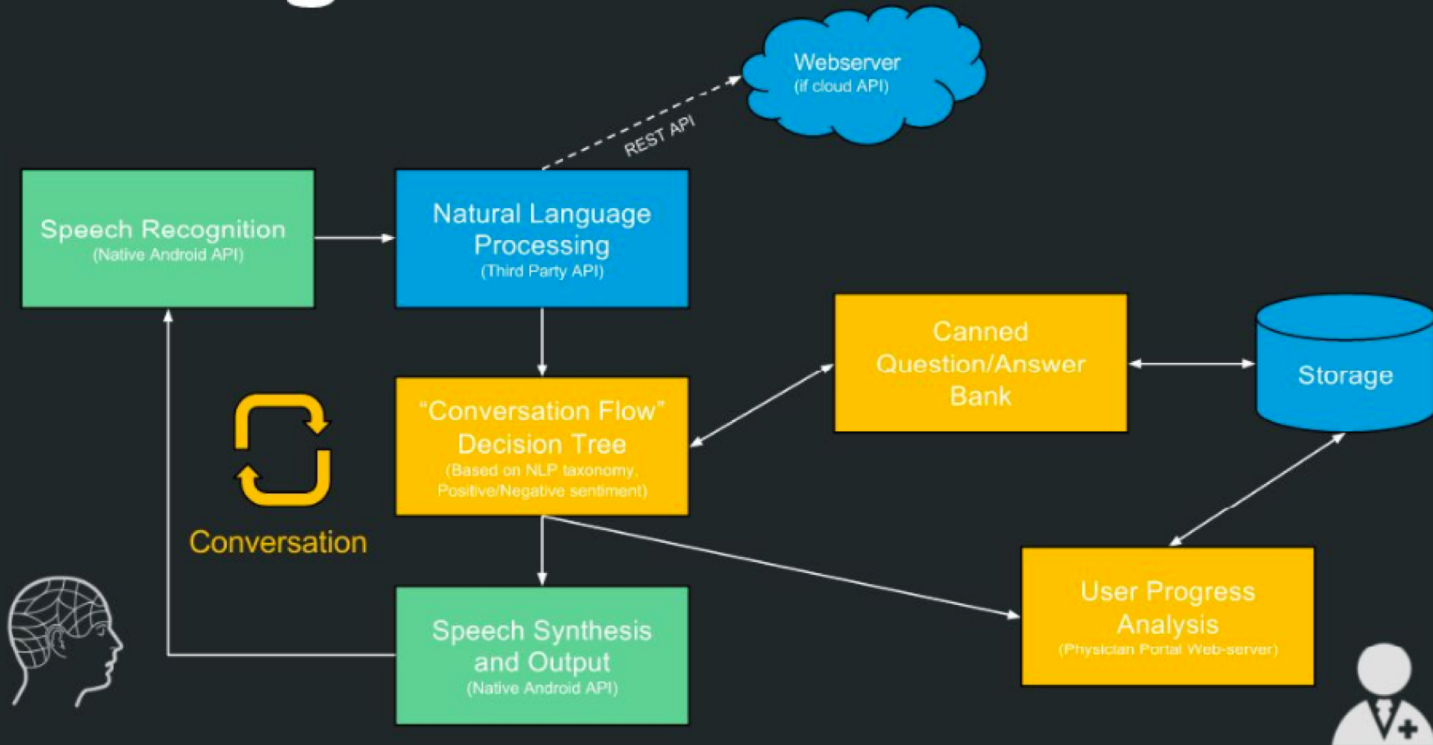


Better, but maybe too simple



Good

Block Diagram



Example App/Block Diagram

The Covid Connector App



Let's Work Through an Example

- I came up with this idea recently

- Problem:
 - There's a highly contagious pandemic going on (this one, and maybe the next one)
 - Transmission occurs through the air, and with proximity
 - People are used to getting together, and it is hard to visualize, and conceive how transmission can happen

- Goal: To visualize the human-to-human connectivity “picture” that shows pathways of virus transmission
 - For **You** and your friends/contacts and family

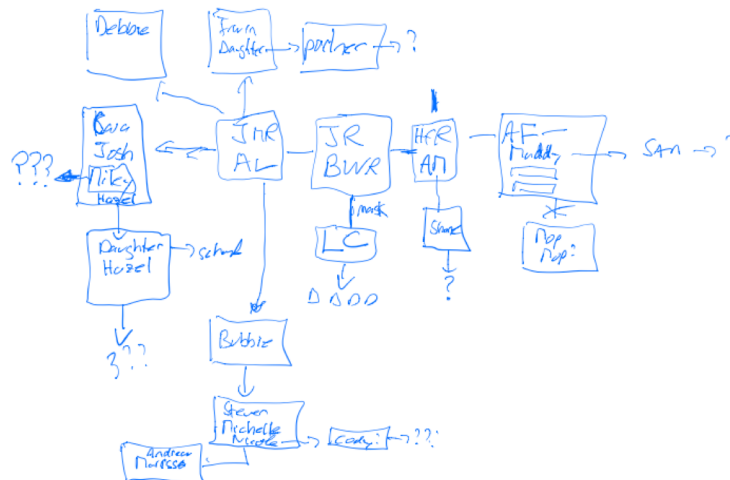


Personal Story

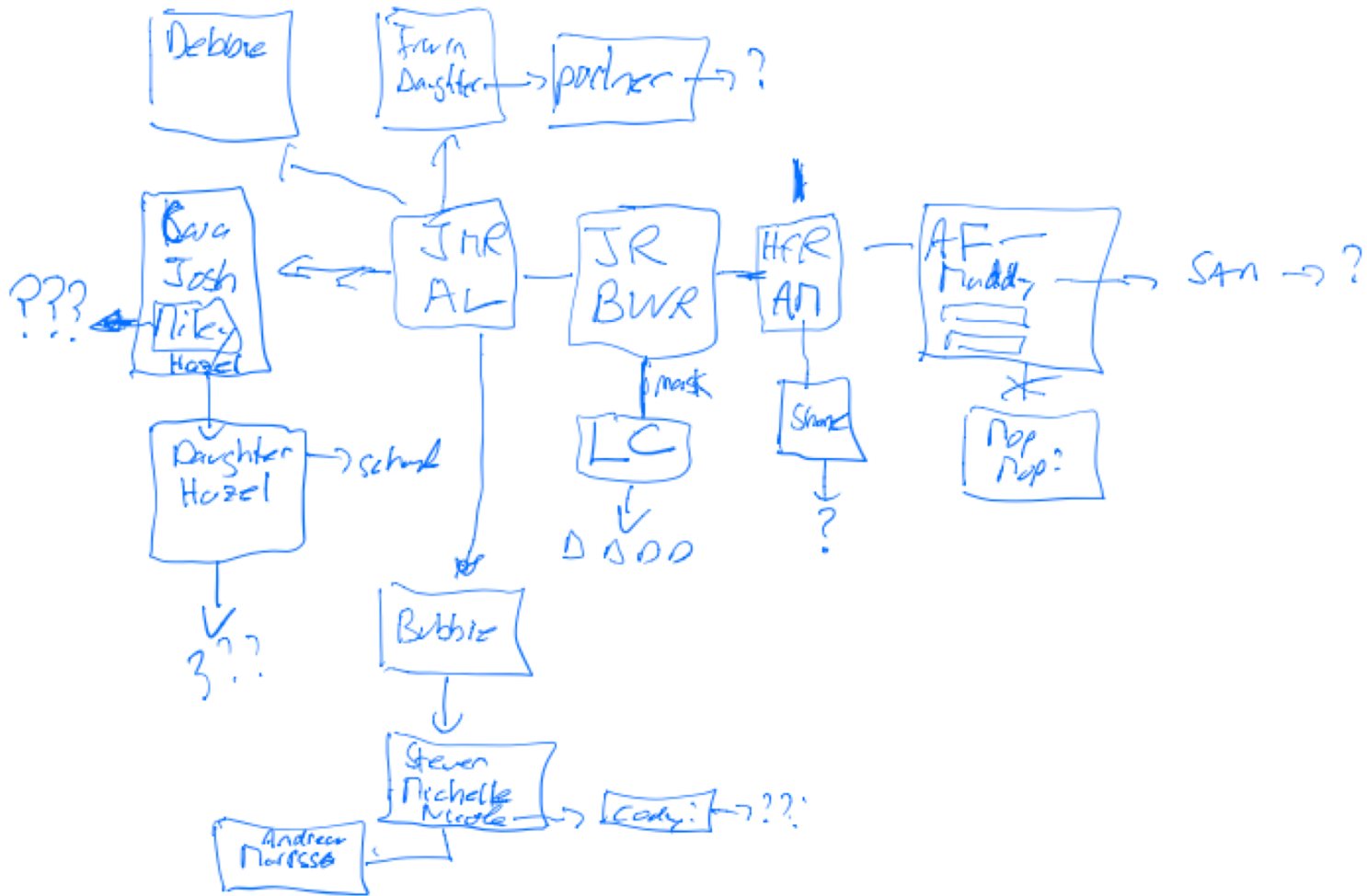
- I was concerned that my family didn't understand this
 - Asked everyone to meet on Zoom, so we could discuss
 - Realized that it would be helpful to draw a picture of who connected to who.



Why picture of funny dog?



Here's the Picture



It's People Connected By Links

- People in a box live together and are regularly exposed
- A link means that those people also meet
- In one of four ways:
 1. Un-masked, close proximity
 2. Un-masked, but with social distancing
 3. Masked, close proximity
 4. Masked, social distancing
- Some links connect to “infinity”
 - child goes to school
 - Roommate’s boyfriend has unknown contacts
 - Infinity is scary; just seeing that (and agreeing) is informative)



Possible Goals of App

1. Allow people to draw picture and annotate links
 - Enable a discussion
2. Allow two separate 'pictures' (**aka Graphs**) to be joined when one learns of connections between two people in separate graphs
3. Voluntary Contact Tracing
 - If learn one member has contracted disease, can immediately notify everyone who is linked
 - There are various levels of notification, depending on risk tolerance (link through mask less likely, e.g.)



What Else?

- You get the idea. There are more possible ways to use (and abuse) this basic notion.
- Try to ‘live’ this app, and imagine how else it might be used.
 - ‘play with it’
 - Look from inside
 - Imagine you’re a health specialist
 - Imagine some communities that don’t believe what the “Government” is telling us.



App Goal:

- Build and Use the Covid Connectivity Picture
 - ?
- How could you do this with a phone?



Let's Make the Block Diagram

- What are the main components?
 - Switch to iPad



A Note on Group Interaction



Group Interaction

- Now that groups are formed, it is very important for you to meet regularly and coordinate your activities
- Each of you will need to be assigned tasks, and make commitments to do those tasks at a particular deadline
- The expectations that each group member has of the others must be made clear
 - I suggest that these be written down
 - **Each** meeting in which tasks are decided:
 - Tasks should be recorded at end of each meeting ->emailed/web
 - What
 - Who
 - When



“When” is a guess

- **Just** because you thought you could get something done, doesn't mean you will be able to
- Tasks deadlines may have to 'slip' because of under-estimation
- is reality of engineering and indeed all work
 - A key opportunity to learn how to estimate work!
- Group must be forgiving of missed tasks
 - **But must** communicate slip and re-organize goals



Difficulties Can and Do Happen

- Most of the difficulties that have occurred in this course have been because expectations were not made clear
- Sometimes, group members consistently failed to live up to commitments.
- If this happens, please report it to me as soon as it is something that you cannot handle with internal discussion & resolution
 - We will help you resolve it
- Disagreements are part of all human relationships
 - One distinguishes oneself by how well you deal with them



What is a good way to communicate?

- Your favourite messaging app
 - Whatsapp, FB Messenger, WeChat....
- **Slack** - <https://slack.com/intl/en-ca/>
- Skype/Google Hangouts/Zoom
- Github Issue tracking



That's About What Could Go Wrong

- What about doing things to make it go right?
 - See above about basic organization
- What is a good way to create a successful group?
 - Get to know each other – find out goals and interests
 - have some meals together – breakfast lunch or dinner.
 - Practice the notion of listening and giving everyone's ideas a fair hearing.



GitHub Requirement

- We require you to use GitHub for storing software and tracking issues
 - Aside: what is source code control?
 - Demo issue tracker on github.com
- I will create the repository for you, and make **all** group members collaborators
 - Including specialists
 - Repository will be private
- Your immediate task, by this Friday:
 - Send me your **GitHub ID** so I can connect you to the repo
 - If you don't have **ID**, go to **github.com** and sign up
 - Then send your GitHub ID to me with group name
 - I will link you to the repository



Class Participation & Peer Review



Class Presentations

- A key part of what happens in this course is the contribution you make to other's projects
- You will do many presentations in this class
 - Indeed, one side-effect of this project course is some real practice in giving high-quality, concise & clear communication
 - Most presentations will be 5 minutes in length
 - Must be geared so that most people in the class will understand



Peer Review

- Want everyone to come, listen & provide useful feedback
- Expectation that you'll listen and provide thoughtful feedback and suggestions to other's presentations

In Addition

- For each of Proposal, Spiral 2, and Spiral 4 you'll be asked to provide a written peer review for one other group; these will be graded
- Means you'll need to be here for every lecture, not just when you're presenting.



Peer Review for Proposal

Will be asked to answer questions such as:

1. In your own words, what was the goal of the project?
2. What parts of the proposal did you understand, and what parts could be more clear?
3. What was the best thing about the proposal?
4. What one thing could be improved the most?



External Hardware for your Project



External Hardware/Gadgets

- If you know of some external hardware that will enable your project, you can request to have it purchased
 - I try to collect these for this course and research
 - No guarantee, depends on cost & function, but ask if you see something interesting!

- Some Examples



Texas Instruments Sensor Tag 2

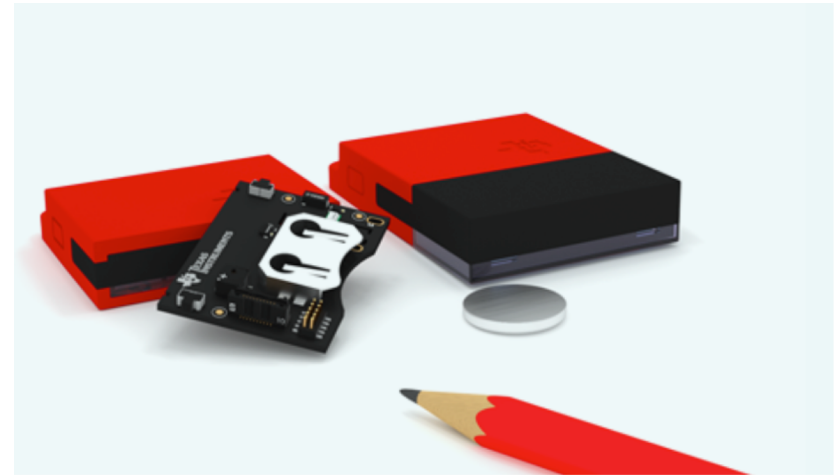
■ Bluetooth Connection

■ Sensors:

- 9 axis
- Magnet sensor
- Light
- Ambient temperature
- IR temperature
- Humidity
- Air pressure
- Two Buttons, two lights, quiet buzzer!

■ I can order these as needed

■ Demo



Muse Head Band

- Measures 'brain activity' through measurement of electro-magnetic waves brain produces
- Have 1 of these



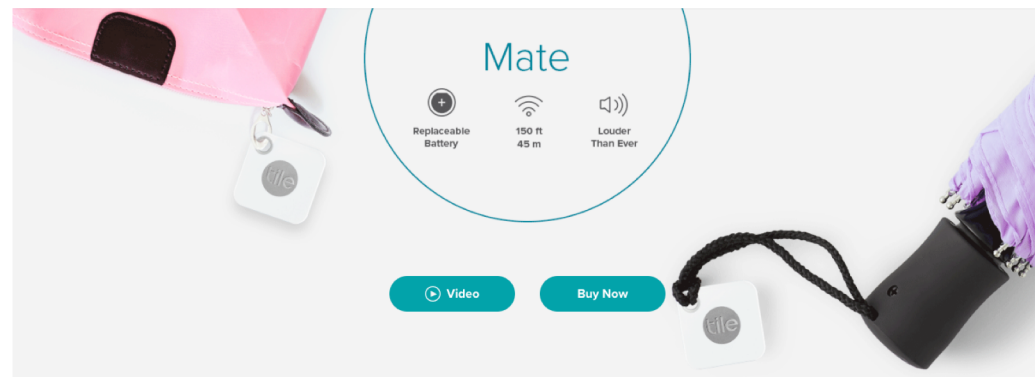
TILE Tracker

■ Note where things are, where they were lost!

- <https://www.thetileapp.com>
- <https://youtu.be/WG7BdW7iFzo>

- Don't have any, but could order
- There is an unofficial API documented/coded here:

- <https://github.com/bachya/pytile>



Other External Devices I have

- Wahoo Tickr (1) – heart rate monitor strap
 - bluetooth connected
 - Direct live heart rate
 - Actually now have several of these



- Mbientlab device (older now, can get newer one)
 - See <https://mbientlab.com>
 - Smaller than TI device

My App: TeamChooser

Solving a Problem in Pick-up Team Sports

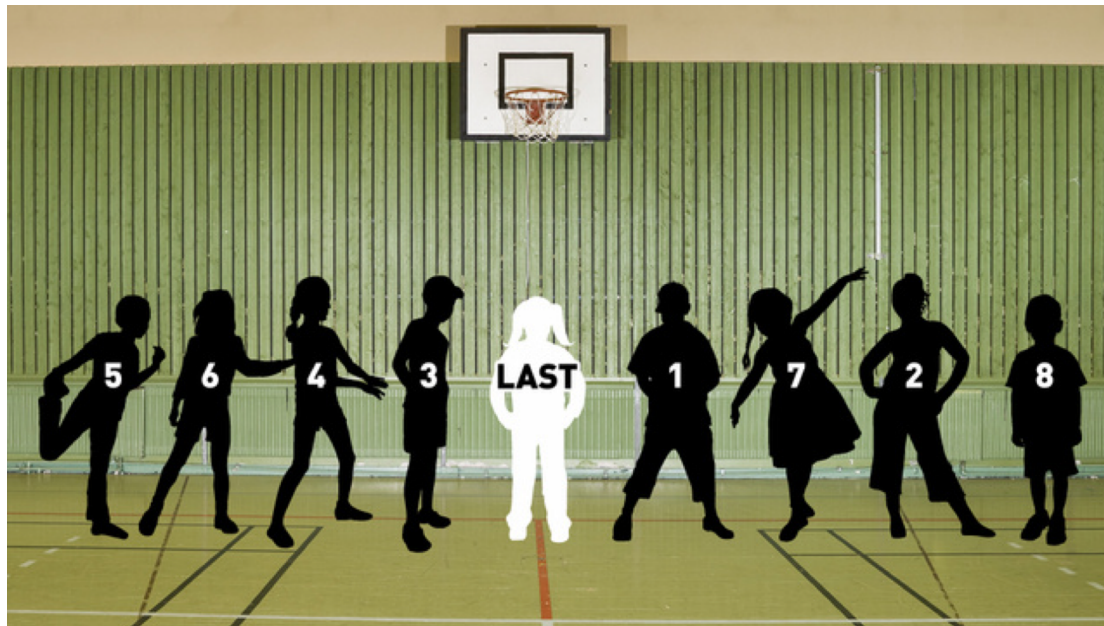


Kids Who Play Want Games to be Fair!



So Do Adults!

- When playing friendly games there is a need to choose who is on which team
- A common method is to have team captains, and they alternate choosing people, in a very public way
- How many people have been picked **first**? 😊
- How many people have been picked **last**? ☹️



I've Been Playing Hockey for Many Years

- A friendly game, but still have problem choosing teams:
- Classic Canadian method:
 - Put players' sticks into middle
 - One person randomly throws sticks to either side!
 - Random outcome!
- I once chose teams for a few years in friendly game
 - People complained a lot!



Play in Two Different Friendly Games

■ Wednesday Game: terrible chooser (**Agar**)

- People always complaining
- Games often lopsided, much distaste
- no-one else took over, though (didn't want the hassle?)



■ Sunday Game: excellent chooser (**Paul**)

- Paul had a natural ability to pick great teams!
- Even when teams didn't look right, many more times than not, the game was fair
- Became known as the '**algorithm**'



The Solution: TeamChooser

- Wouldn't it be great if an App made the teams?
 - No one to yell at
 - Possibly give better teams
- Who needs this?
- Every pick-up hockey, soccer, basketball game around!



TeamChooser: How It Works

- Enter every player's information in advance of game day
 - Player's name
 - Preferred position (offence or defense)
 - **A rating, from 1-10, as to how effective player is**
 - Rating is the trickiest part
- On game day – select all players present
- Push '**Make Teams**'
 - And voila, two evenly matched teams



Do Demo! Entering Players

Carrier  2:01 PM 

[Done](#) Add Players

AmdurWedFri has 99 players

Name

Level (0-10) (e.g., 5.4)

Offense Defense

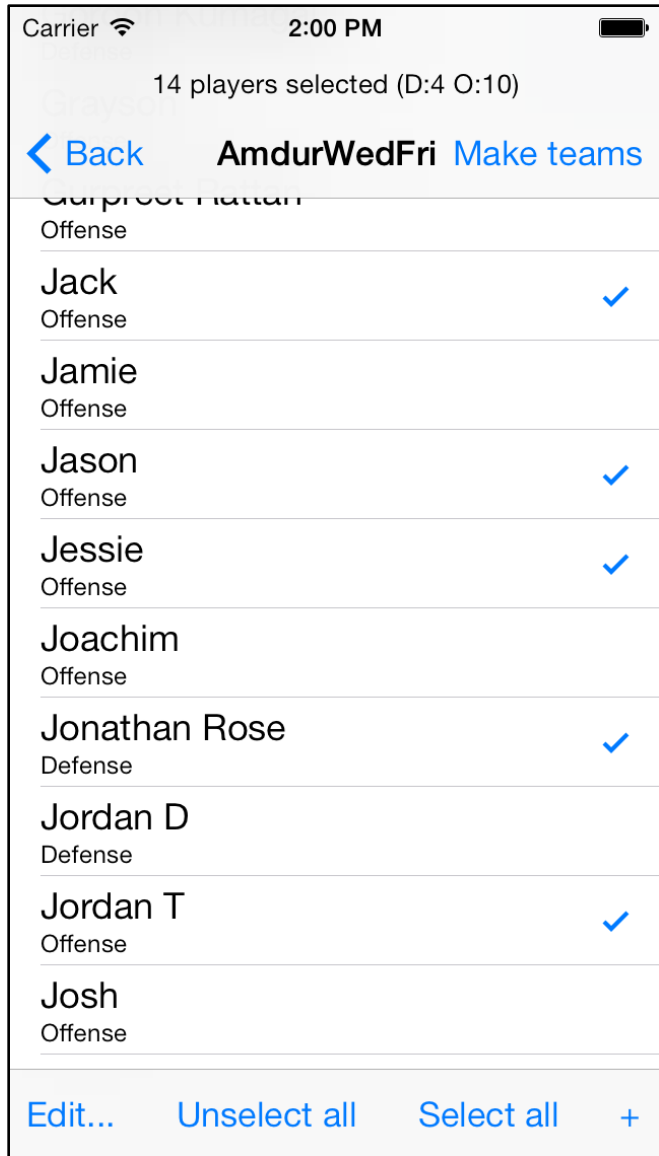
Pre-assign

Light Dark

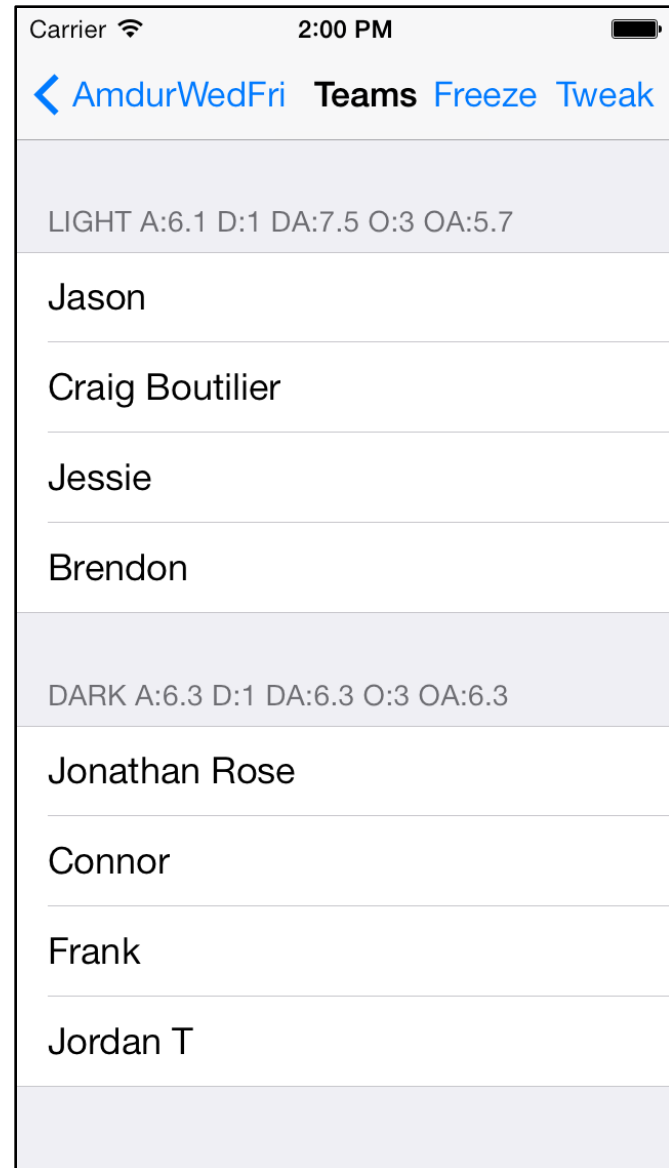
[Save](#) [Delete](#)



Selecting Present & Making Teams



5)



Example Game

Dark Team

Light Team

DARK 5.6 D:5.0 O:5.7 COUNT: 6

LIGHT 5.6 D:5.4 O:5.7 COUNT: 7

Cole Zeme

Brian Dov

Pavel

Raj B

Matt Zale

Rich Zemer



Gurpreet Rattan

Final Score in that Game

- A Victory for Team Chooser!



Team Selection Method ('Algorithm')

Step 1: Sort Players in Order of Rating, Highest to Lowest

Step 2: Alternate Team Assigned Going Down List

Team A

6

Team B

5

4

3

2

1



Team Selection Method

- Gets more complicated when add features!
 - Balance offense and defensive player count
 - Pre-assigns
 - Balance quality of offense and defense
- Many discussions from CS and ECE Professors over algorithms in hockey game!



Relating to Assignment S3



Features in App – Current and *Desired*

1. Input System – entering names and ranks
2. Choosing process and display
 - Very neat choosing + rating feature!
3. Randomized Order of Team Lists
 - So no-one is picked last
4. Large Font Button for far-sighted old folks!
5. Constraint: put selected people on fixed side
6. Constraint: equalize # of offence and defence-minded on each side
7. Late Arrival feature
8. *Infer people's rating based on result*
9. *Email/Share team files amongst multiple people*
10. *Print Out Chosen Teams⁽⁷¹⁾ for Posting*



Does it Work?

- Yes!
- I've been using it with friends in roughly 600 hockey games and it has often done a good job.
 - We've tweaked it's algorithms here and there
 - Added some features
 - Occasionally very unbalanced games, bad luck?



On iPhone App Store Since May 2010

App Store Preview

This app is available only on the App Store for iPhone and iPad.



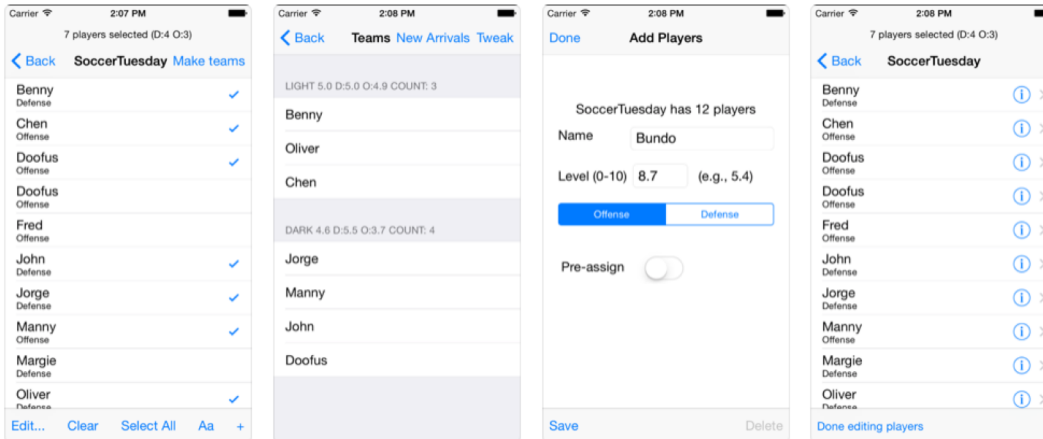
TeamChooser 4+

NP Press

★★★★★ 5.0, 1 Rating

Free

Screenshots [iPhone](#) [iPad](#)



Do you play friendly pickup sports, like hockey, soccer or basketball? Would you like help choosing which players to be on each team, so that everyone enjoys the game? Then TeamChooser is the app for you! TeamChooser will work for pretty much any two-team game you can think of: rugby scrimmages, volleyball, baseball, and flag football.

[more](#)

(73)

- Free!
- 6500 total Downloads
- Mostly in US/Canada, but a few in UK, Ireland, Japan, Norway, Romania, Portugal, Australia, Denmark, Finland



Units

App Store Connect App Analytics

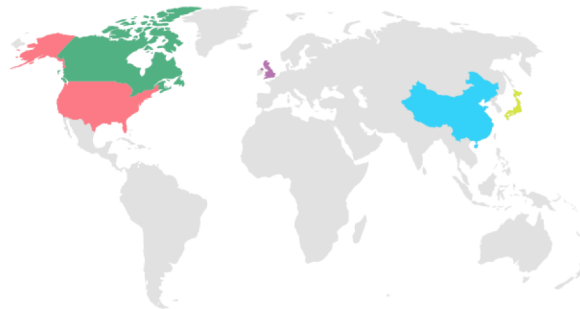
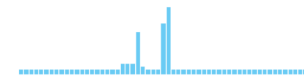
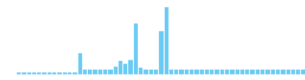
TeamChooser

Jonathan Rose

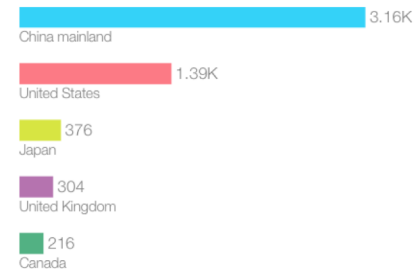
Overview Metrics Sources Retention

About App Analytics Data

Apr 1, 2015-Jan 24, 2020



App Units by Territory



App Units by Source



Lesson Learned

- From last time: Ratings of players, key part of engine, **must be kept secret!**
- Can add password to App so no-one can grab phone and look at their ratings or anyone else's



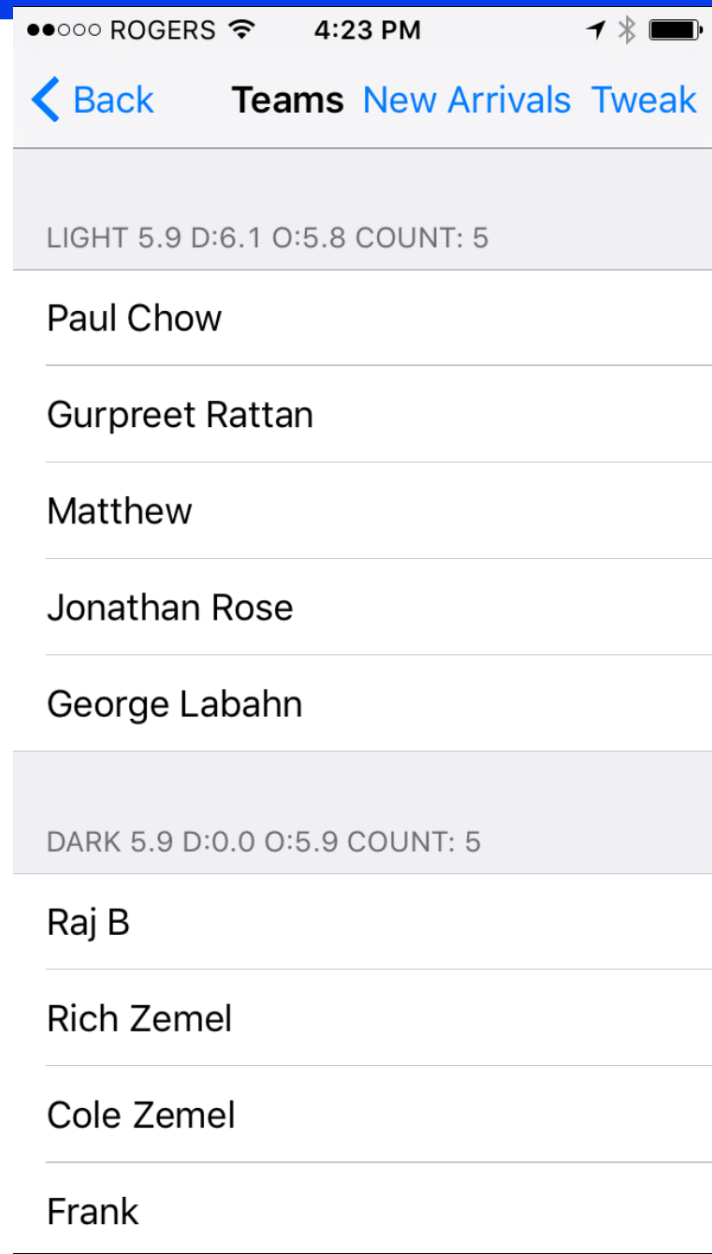
Sad Outcome: Agar

- The day after the first use of TeamChooser on Wednesday
 - Recall very poor chooser – Agar
 - Folks joked and called it the iGar.
- **Agar never played again on Wednesday!**
 - Still plays hockey, but not with team he played with for decades



Feature: No-One Chosen Last!

- The order that people are listed (and spoken out loud by user) is randomized
- There is no way to infer rating



Downloads Over the 30 Days Feb 2020

■ Is delightful to see people using!

App Store Connect App Analytics

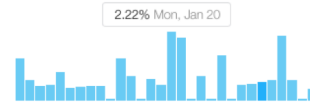
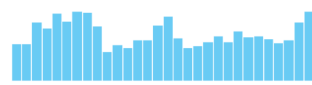
TeamChooser

Jonathan Rose
Jonathan Rose

Overview Metrics Sources Retention

About App Analytics Data ?

Last 30 Days (Dec 27, 2019-Jan 25, 2020)

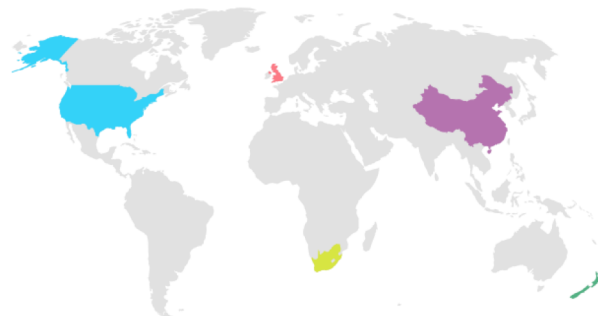


\$0 Sales

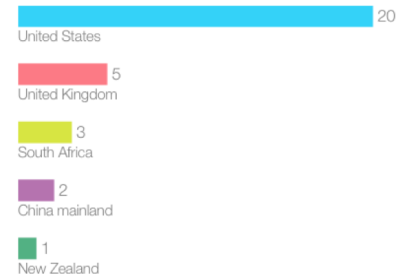
\$ (Daily Average) Sales per Paying User

3.52 Sessions per Active Device (Opt-in Only) ▼ 0.25%

6 Crashes (Opt-in Only) ▲ 50%



App Units by Territory

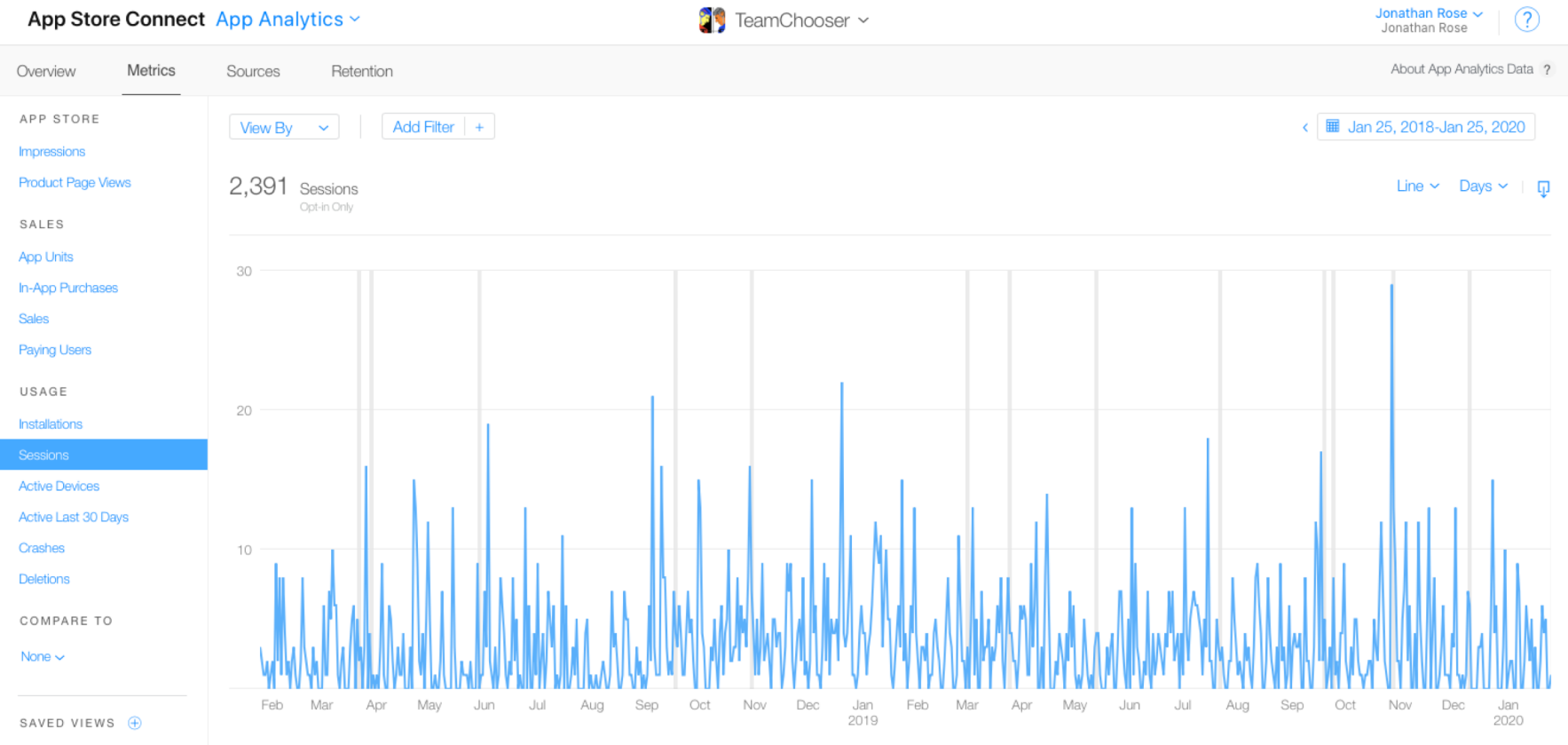


Is Anyone Using it Who Bought It?

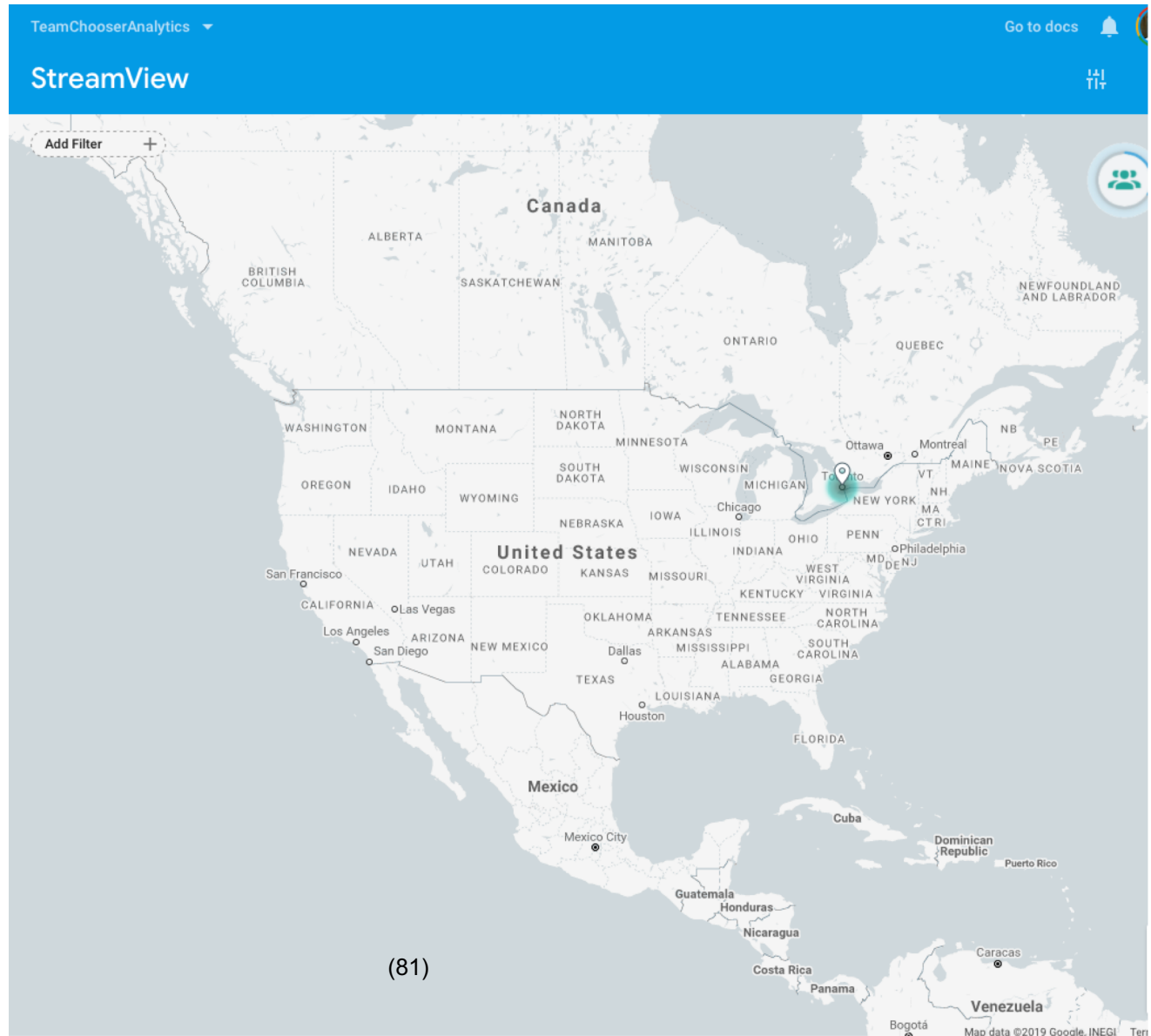
- Instrumented both with Apple Analytics & Firebase analytics
 - Very easy to insert into any app
- Reports:
 - # of users sessions, amount of time spent on app
 - Specific pages/events, as you wish from each user
 - Location of user, if already use GPS (no other ID).
 - **Anything I wish to report!**



Session Report from Apple Analytics

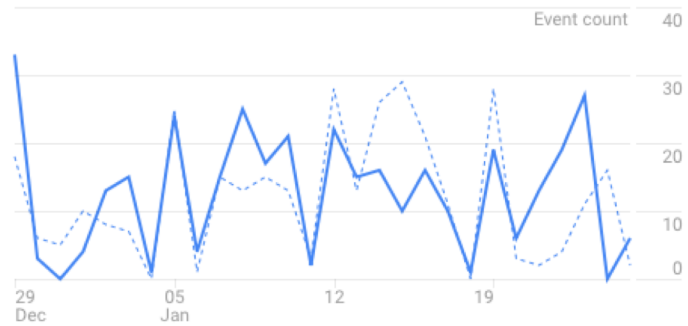


Stream View – Live!



Event Logs

data

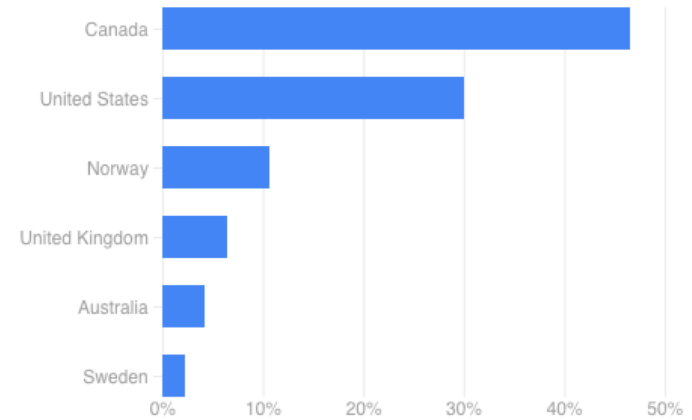


	Count	Users
<input checked="" type="checkbox"/> (total) 183 items	357	26
<input type="checkbox"/> (not set)	15	1
<input type="checkbox"/> Sunday Night ...3 BDef 8.00	9	1
<input type="checkbox"/> Sunday Night ...3 BDef 7.75	9	1
<input type="checkbox"/> Sunday Night ...0 BDef 8.25	8	1
<input type="checkbox"/> Hudson Hock... BDef 24.00	7	1
<input type="checkbox"/> Bowling AAvg...0 BDef 0.00	6	1
<input type="checkbox"/> AmdurWedFri ... BDef 7.73	5	1

Event location ⓘ



Country/Region



Topic Discussion Time



Groups in Progress

Approval in Principle	OS	Project Name	Specialist
Yes	iOS	Tootti	Ricci I
Yes	Android	Track-a-mole	Neall S
Yes	Android	Interview log	Hsiang-I
Yes	Android	Protosight	Bonnie
Yes	iOS	CalmMind	Annie
Yes	Android	Ready	Ingrid
Yes	iOS	iPhasia	Stéphani
Yes	Android	Re:Food	Zachary
Yes	iOS	Chordable	Bahar C
Yes	Android	IllumiSmart	Changcl
Yes	iOS	Present Better	Casey G
Yes	Android	Dynasway: Concussion	Calaina
Yes	iOS	NWTO	Don Ca
Yes	Android	U Health	Jaime O.
Yes	Android	Paxifist	Gissel
Yes	iOS	Flexinome	Aaron
Yes	Android	ParkinSense	Carolina G
Yes	Android	Lightbulb	Neil D
No	Android		Andrei
Yes	iOS	NONAME	Mélina C Brad

