SWARM

Compute for the community.
By the community.

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Built with Perplexity & Notion.

Interviews + User groups

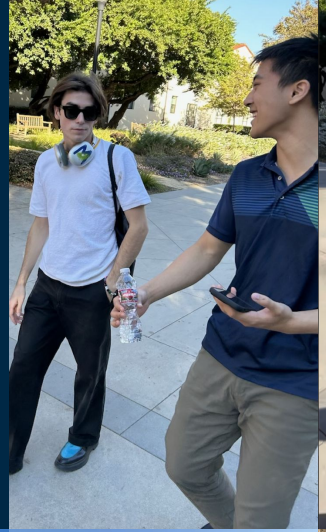
What did you do with your last laptop when you upgraded?

How often do you upgrade your phone or laptop?

What's the oldest electronic device you still use regularly?

What's your main reason for replacing electronics—tech issues, new features, or something else?

What feedback do you have for recycling vs. upcycling?





Talking to Customers

"[Upcycling into a computer lab] sounds really cool, so I'll go with that one"

—Interviewee #1

"My oldest device is my phone, and I got it a year ago"

—Interviewee #2

"I just got a new phone pretty recently but I had an old iPhone SE"

—Interviewee #3

"I still have [my laptop], I don't know what to do with it"

—Interviewee #4

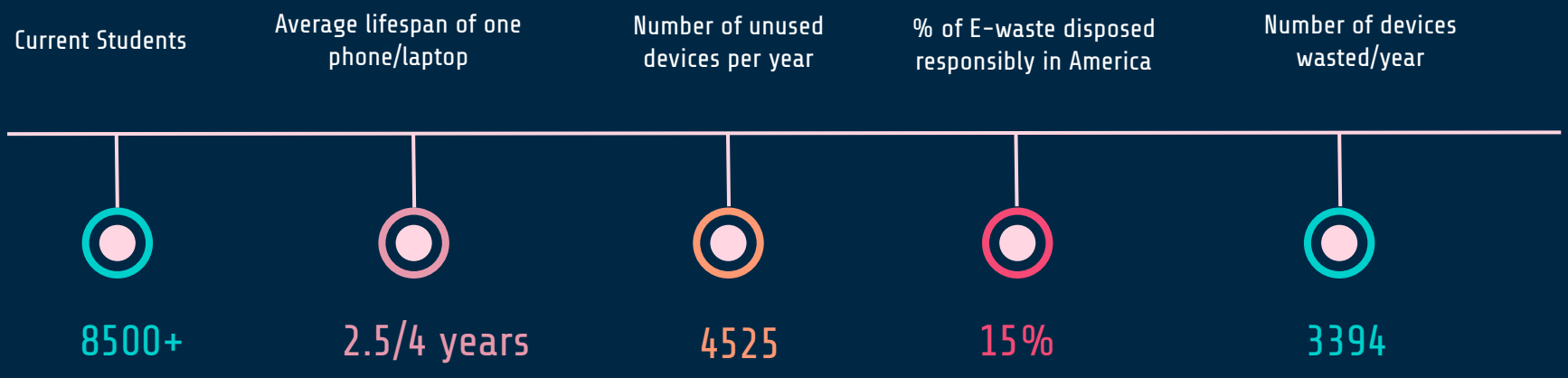
"I always support upcycling with e-waste, it's very important"

—Interviewee #5

"This is more economical and more climate-friendly"

—Interviewee #6

Within the Claremont Colleges



User Groups Identified

"Hoarders"

"My laptop has a minor issue. I'll just buy a new one and let my old one sit in my drawer."

"Discarders"

"The new iphone 16 just came out! I don't need my old one anymore. I'll throw it away."

Researchers

"I need access to computing power for my research but my lab's funding can't cover it!"

Empathy Map

Says	Thinks
• "I need the latest gadgets to keep up with my studies." • "I have a pile of old electronics but don't know what to do with them." • "Throwing them away feels wasteful"	• There must be a better way to get rid of my old devices. • I should declutter, but it's overwhelming • Donating might be a good option if it helps others
Does	**Feels**
• Frequently upgrades to new technology • Stores old devices under her bed • Avoids dealing with the growing pile of electronics	• Overwhelmed by clutter • Guilty about potential waste • Eager to find a responsible solution

POVs: Hoarders vs Discarders

User: A Physics major from Denver.

- **Behavior:** Upgrades laptops frequently; hoards old devices.
- **Need:** An way to dispose of electronics that benefits others responsibly.
- **Insight:** Knowing donations aid impactful research would motivate them to declutter

User: An Economics major from Chicago.

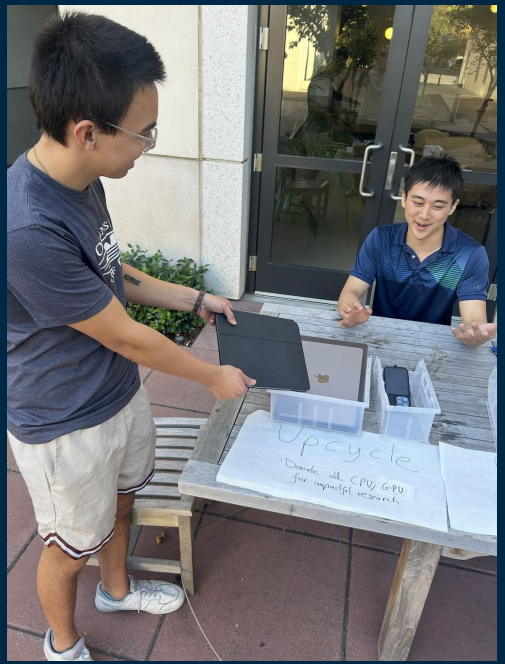
- **Behavior:** Discards old/unused smartphones in the trash.
- **Need:** Awareness of e-waste impact and simple recycling options.
- **Insight:** Learning his devices support research and the environment could encourage proper disposal.

PROBLEM STATEMENT

How can we repurpose unused devices in our college community to reduce electronic waste?

IDEATION

Testing: Iteration 1



Upcycling for the win!

Testing: Success Metrics & Feedback

Feedback

Scheduling: Need for specific booking times due to students' busy schedules

Visceral impact: Importance of communicating the tangible benefits of donating resources (e.g., how their compute donations are used and why it matters).

Station Utilization Rate

Measure: Percentage of booked vs. available slots.
Success Indicator: Consistent high utilization (>75%).

Non-Profit Research Savings

Measure: Money saved for research through donated compute resources.
Success Indicator: Dollar value of compute resources provided to non-profits.

User Benefits from Product Donations

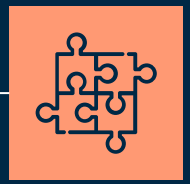
Measure: Survey data and user feedback on the personal or emotional impact of donating (e.g., sense of contribution, learning outcomes).
Success Indicator: High satisfaction rate and perceived positive impact (>80% of users report a positive experience).

OUR SOLUTION

01

COLLECT

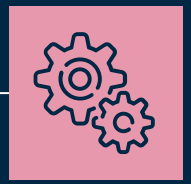
Allow users to select and view the closest e-waste drop off center to them through an application



02

COLLATE

Compile the resources all in one lab from each of the different drop-off centres



03

COMPUTE

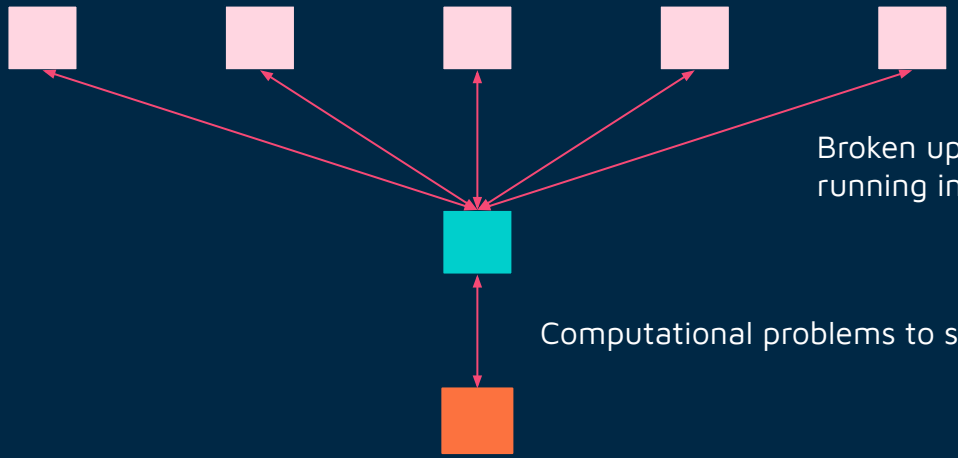
Creating a compute network that is comprised of the clusters of electronics that can solve computationally intensive problems

SWARM Compute Network

Collected E-Waste Nodes

Load Balancer

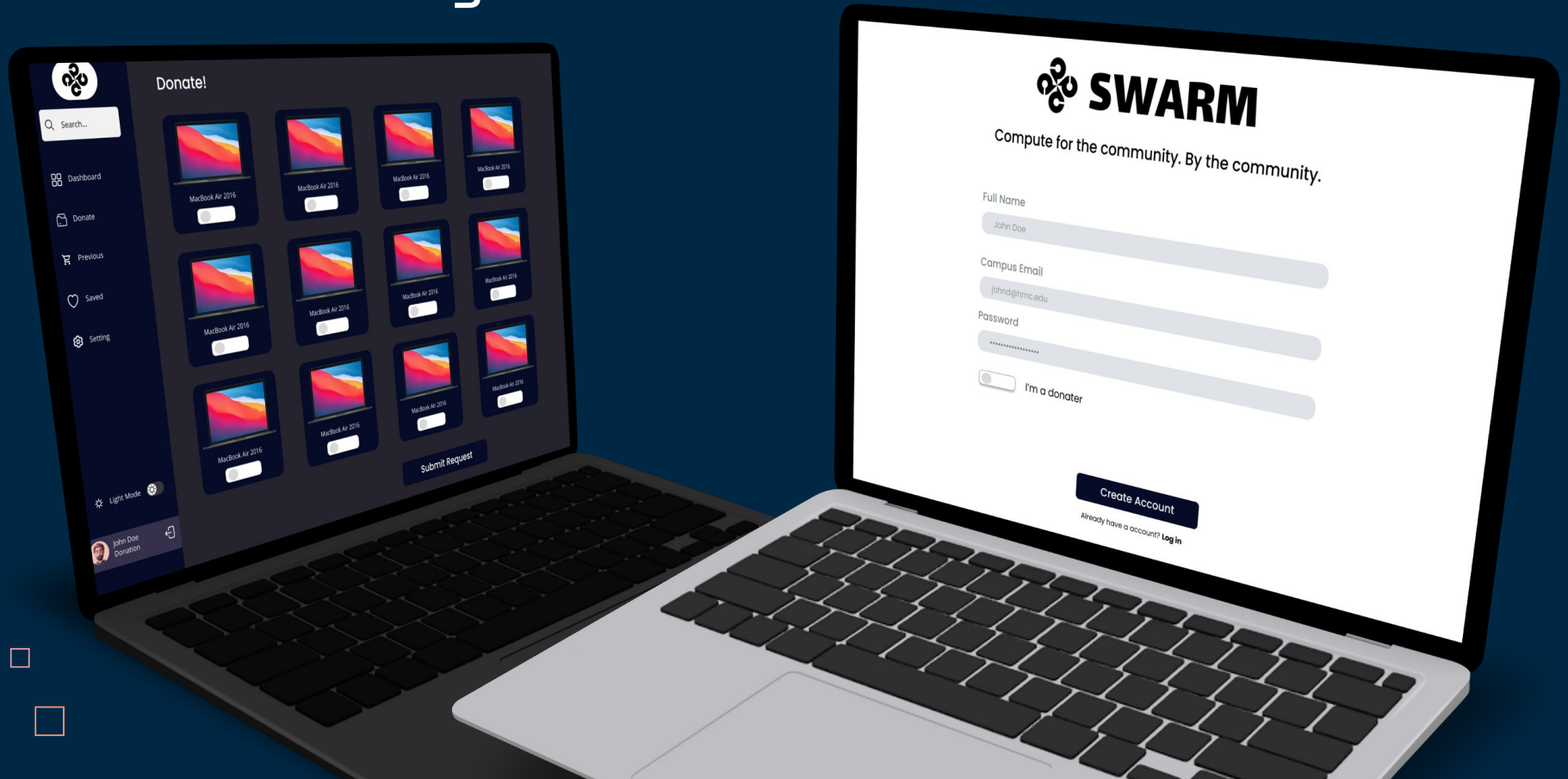
Researchers



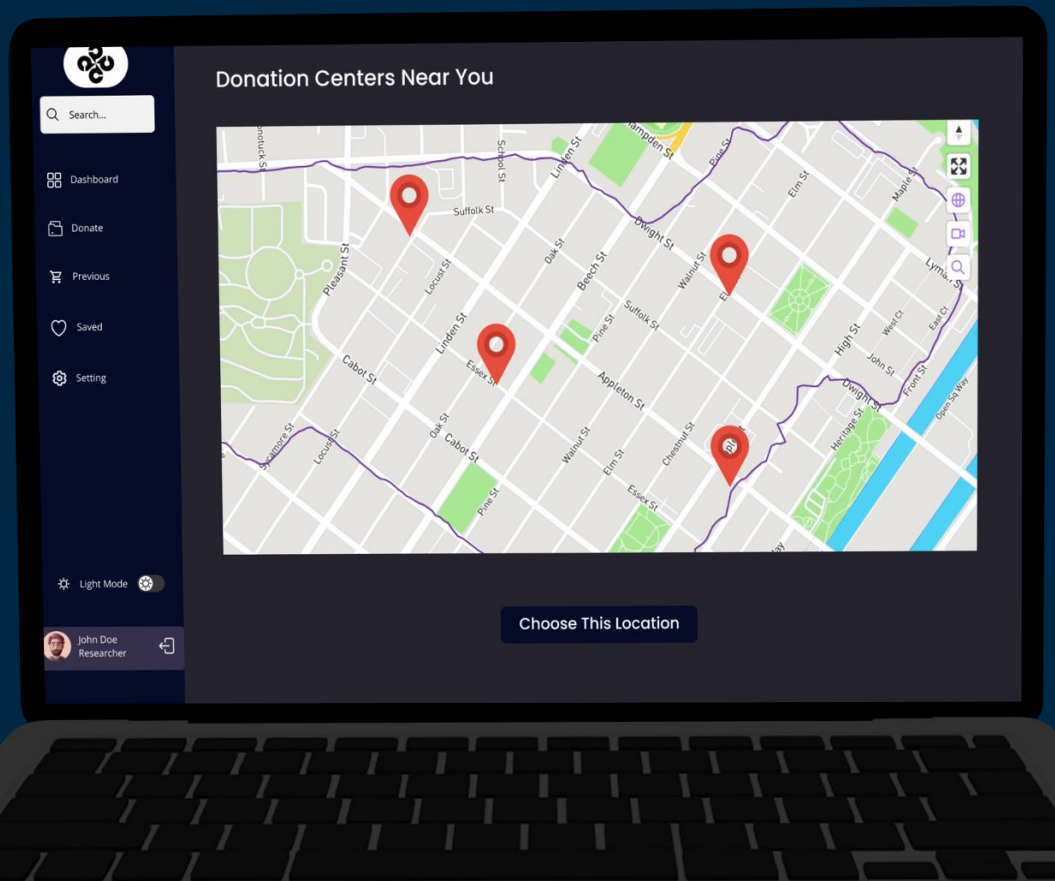
Broken up “mini-problems” running in parallel

Computational problems to solve

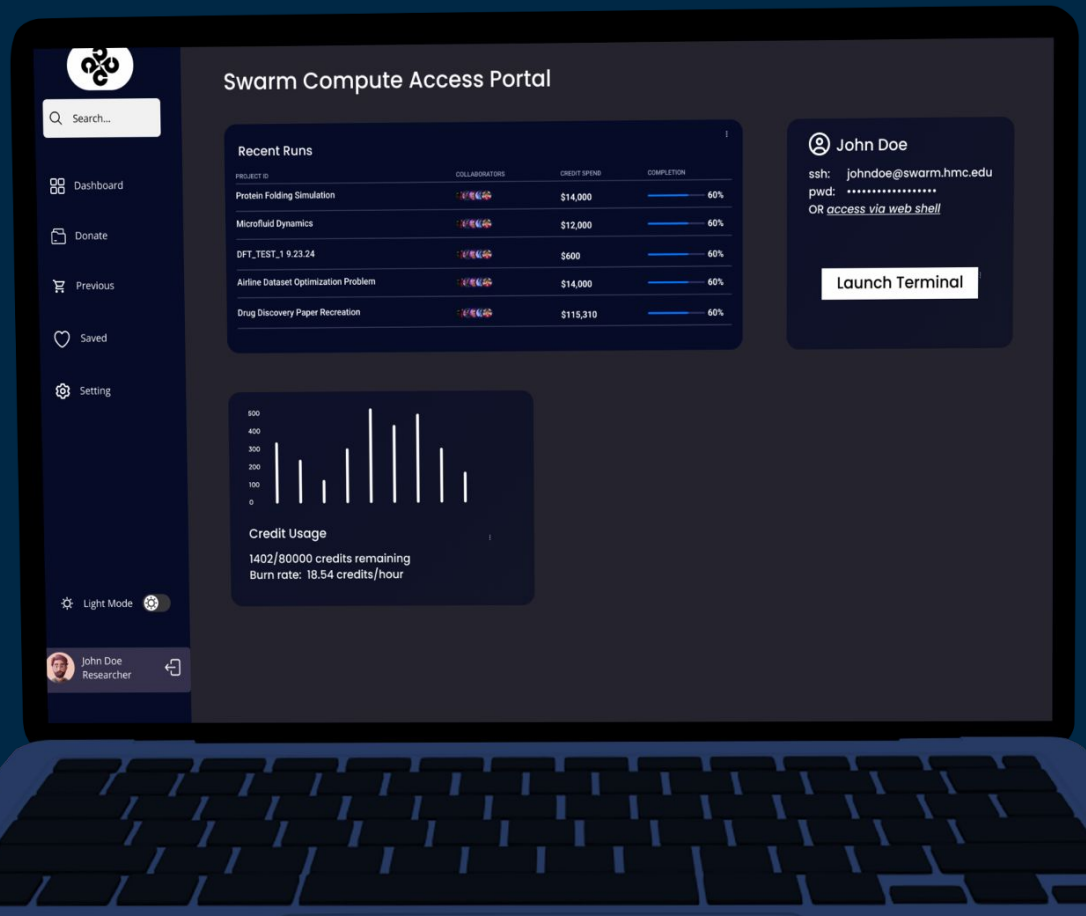
Iteration 2: Figma



Iteration 2: Figma



Figma

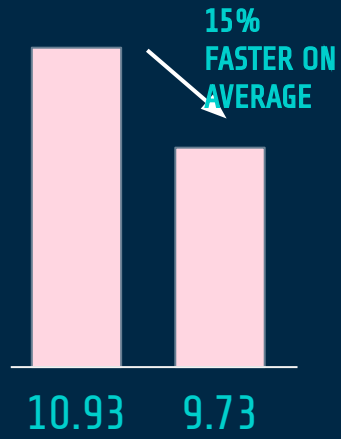

Swarm Compute Access Portal
Search...
Dashboard
Donate
Previous
Saved
Setting
Light Mode
John Doe
Researcher
Recent Runs
PROJECT ID
COLLABORATORS
CREDIT SPEND
COMPLETION
Protein Folding Simulation
$14,000
60%
Microfluid Dynamics
$12,000
60%
DFT_TEST_1 9.23.24
$600
60%
Airline Dataset Optimization Problem
$14,000
60%
Drug Discovery Paper Recreation
$115,310
60%
John Doe
ssh: johndoe@swarm.hmc.edu
pwd: ••••••••••••••••
OR access via web shell
Launch Terminal
500
400
300
200
100
0
Credit Usage
1402/80000 credits remaining
Burn rate: 18.54 credits/hour

DEMO

With our clustering system, we're able to make computations **15%+** faster on average, by simply adding one extra node to our network...

```
(base) rohandesai@Rohans-MacBook-Pro-6 dockerPOC %
Task completed in 10.93 seconds.
```

```
(base) sam@Sams-MacBook-Pro-4 Yes % python3 compute_server.py
Server waiting for connection...
Connected by ('172.28.125.84', 55141)
Server starting its tasks...
Task completed in 3.78 seconds.
Client task completed in 5.80 seconds.
Total distributed computation time: 9.73 seconds.
```



From 0 to 1...

- How does computing like this scale? What architectures are better: Kubernetes vs Swarms
  - Does this scale O(log(n))? If so, there's a carrying capacity at which we're not increasing compute in any significant way
- With larger devices, we need to set up VMs on every device to make the architectures play nicely together
  - Might be a problem on very old devices
- This is only useful in problems that can utilize *parallelization* or other other styles of distributed computing
  - This covers really big research spaces like unfederated learning, but other problems may need some large-scale rewriting or aren't compatible.